S
634.92K
U19eafmp
1986
Environmental assessment of major forest management alternatives considered for implementation in

STATE DOCUMENTS COLLECTION
JUL 1 8 1989
MONTANA STATE LIBRARY
1515 E. 6th AVE.
HELENA, MONTANA 59620

FLATHEAD INDIAN RESERVATION

ENVIRONMENTAL ASSESSMENT FOR THE DRAFT FOREST MANAGEMENT PLAN

1982—1991

MANAGEMENT PERIOD

PLEASE RETURN

JUN 1 9 1991
MAR 1 5 1995

MONTANA STATE LIBRARY
S 634.92 U19eafmp 1986 c.1
Environmental assessment of major forest
3 0864 00062230 1

ENVIRONMENTAL ASSESSMENT FOR THE
FLATHEAD INDIAN RESERVATION
FOREST MANAGEMENT PLAN 1982-1991

CONFEDERATED SALISH AND KOOTENAI TRIBES
MONTANA
OF THE FLATHEAD RESERVATION

U.S. DEPARTMENT OF THE INTERIOR
MARCH 3, 1849

UNIVERSITY OF MONTANA · LUX ET VERITAS
· 1893 ·

Digitized by the Internet Archive
in 2016

https://archive.org/details/environmentalass1986univ

Environmental Assessment of Major Forest Management Alternatives Considered for Implementation in the 1983 Forest Management Plan for the Flathead Indian Reservation

Prepared by
School of Forestry
University of Montana
Missoula Montana 59812
1984

Responsible Agency: Flathead Indian Agency
Department of the Interior
Bureau of Indian Affairs
Pablo, Montana

Reprinted in 1986

TABLE OF CONTENTS

Page No.

Part 1:

INTRODUCTION . . . 1
  Purpose of and Need for Action . . . 1
  Objective of the Environmental Assessment . . . 6
  List of Contributors . . . 7
  Format of the Environmental Assessment . . . 9
SOCIAL AND ECONOMIC SETTING . . . 11
  Employment and Income Distribution . . . 12
  Reservation Resources and Tribal Government . . . 16
PHYSICAL AND BIOLOGICAL SETTING . . . 32
  Biota . . . 32
  Geology . . . 46
  General Surface Hydrology Perspective . . . 50
  Soils . . . 52
ARCHAEOLOGICAL AND CULTURAL SETTING . . . 69
  Introduction . . . 69
  Some Geographical Considerations . . . 69
  Cultural Management of Federal and Indian Lands and the Laws . 71
  Types of Sites . . . 73
AESTHETIC CONSIDERATIONS . . . 84
  Some Basic Concepts . . . 85
  The Process . . . 86
  Aesthetic Resources . . . 87

Part 2: IMPACTS OF POLICIES ON ELEVEN RESOURCES . . . 95

I. Fire Management Program . . . 95
  A. Fire Suppression Policy . . . 95
II. Timber Sale Program . . . 117
  A. Sale Size . . . 117
  B. Timber Sale Unit Design and Priority Policy . . . 131
III. Silvicultural Program . . . 144
  A. Christmas Tree Cutting Policy . . . 144
  B. Precommercial Thinning Treatment Policy . . . 156
  C. Even-Aged Block Size Policy . . . 168
  D. Mistletoe Control Policy . . . 179
  E. Lodgepole Pine Management Policy . . . 190
  F. Marginally Productive Sites Policy . . . 204
IV. Other Resources . . . 216
  A. Stream Reserve Corridor Policy . . . 216
  B. Big Game Winter Range . . . 227
  C. Old-Growth Timber Policy . . . 237
  D. Grazing and Commercial Timber Lands Policy . . . 248

Page No.

LITERATURE CITED 262

APPENDICES 264
Appendix A: Source Material Obtainable from BIA, Flathead Agency 266
Appendix B: Soils Found in the Flathead Indian Reservation with Reservation with Physical and Chemical Limitations 269
Appendix C: Soils Found in the Flathead Indian Reservation with Physical and Chemical Limitations 272
Appendix D: Cross-Referencing of Soil Series Names with the Closest Family and Subgroup used in the New Classification, Flathead Indian Reservation 275
Appendix E: Some Basic Laws Concerning Archaeological and Historical Materials on Federal Lands 278
Appendix F: Specific Sites In and Near Forest Areas Which Could be Endangered with Forestry Connected Activities 283
Appendix G-1 through G-17: Archaeological Sites 284
Appendix H: Guide for Locating Proposed Policy for Each Management Concern 304

Part 3: ALTERNATIVES

Page No.

INTRODUCTION 307

I. Fire Management Program

A. Fire Suppression 308
  1. Alternative 1. Proposed/No Action Alternative: Keep present policy, i.e., rapid control of all destructive wildfires. 95
  2. Alternative 2: Develop fire plans for designated areas allowing unscheduled ignitions (lightning) to burn under preplanned criteria. 308

B. Prescribed Use of Fire

  1. Alternative 1. Proposed/No Action Alternative: Maintain prescriptive use of fire to treat activity and natural fuels for hazard reduction, silvicultural objectives, wildlife habitat improvement and aesthetics 309
  2. Alternative 2. Reduce or eliminate the prescribed use of fire. 310

II. Timber Sale Program

A. Sale Size

  1. Alternative 1. Proposed/No Action Alternative : Continue present policy, i.e., most sales will range between 2-10 MMBF, with occasional sales to 20 MMBF. 117
  2. Alternative 2. Increase average sale size to 12-25 MMBF. 311
  3. Alternative 3. Identify a number small sale set-asides to maintain Indian loggers and offer remaining volume in sales to maximize income. 312

B. Forest Roads

  1. Alternative 1. Proposed/No Action Alternative: Continue the present policy of designing low standard roads with a transportation system based upon unit area design for long-term timber management. 313
  2. Alternative 2. Upgrade road standards by requiring engineers to design and construct main and secondary haul routes and develop more stringent standards for construction, improvement, and maintenance. 314a

C. Timber Sale Unit Design and Priority
  1. Alternative 1. Proposed/No Action Alternative: Timber sale unit design and priority for offering based largely on silvicultural needs, and mitigate adverse impacts on other resources. 131
  2. Alternative 2. Timber sale design and priority based largely on end products and market conditions. 316
  3. Alternative 3. Design sales and sell them with the goal of providing an even-flow of income to the Tribes. 317

III. Silvicultural Program
A. Christmas Tree Cutting Policy
  1. Alternative 1. Proposed/No Action Alternative: Keep present policy of unregulated Christmas tree harvesting. 144
  2. Alternative 2. Integrate Christmas tree harvesting with timber management on all suitable forest acres. 318
  3. Alternative 3. Establish set aside areas for Christmas tree production, excluding these areas from the sawlog management base. 319

B. Precommercial Thinning Treatment
  1. Alternative 1. Proposed Alternative: Set treatment priorities and base site selection on site quality and vary thinning prescriptions to obtain optimum site-specific stocking levels. Lift all constraints on treatment methodology. 156
  2. Alternative 2. No Action Alternative: Keep current policy 320

C. Even-aged Block Size
  1. Alternative 1. Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives. 168
  2. Alternative 2. No Action Alternative: Keep current policy of maintaining shelterwood block size below 15 acres, and restrict clearcut and seed tree blocks to less than 8 acres in size. 322

D. Mistletoe Control Policy

1. Alternative 1. Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years. 179

2. Alternative 2. No Action Alternative: Continue with present policy which provides for liquidation of Class I infected stands in three 20 year intervals. 322

3. Alternative 3. Selective Harvest of infected stands. 324

E. Lodgepole Pine Management

1. Alternative 1. Proposed/No Action Alternative: Continue present policy of intensifying lodgepole pine managment and access the inaccessible portions of the resource. 190

2. Alternative 2. Manage only the sawlog size lodgepole pine and permit unregulated harvest of unmerchantable lodgepole pine 325

F. Marginally Productive Sites

1. Alternative 1. Proposed Alternative: Identify lands with productive capabilities of less than 20 cu.ft./yr and de-emphasize timber management. 204

2. Alternative 2. No Action Alternative: Keep present policy managing all productivity classes more or less equally. 327

IV. Other Resources

A. Reserve Corridors Along Streams

1. Alternative 1. Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones 216

2. Alternative 2. No Action: Keep current policy of fixed two-chain reserve strips along live streams. 330

3. Alternative 3. No reserve corridors along any stream. 330

B. Big Game Winter Range

1. Alternative 1. Proposed/No Action Alternative: Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range. 224

2. Alternative 2. Restrict timber management from important winter range and remove areas from timber base. 332

C. Old Growth Timber Policy

1. Alternative 1. Proposed/No Action Alternative: Continue present policy of cutting all old-growth stands outside wilderness/inaccessible areas. 237

2. Alternative 2. Manage some stands with an old-growth component and reduce their contribution to the commercial forest base. 332

D. Grazing and Commercial Timber Lands

1. Alternative 1. Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use-restrictions to benefit forage and timber. 333

2. Alternative 2. No Action Alternative: Continue with present policy and guidelines which contain predetermined stocking rates and presently allow mostly unrestricted grazing within the commercial forest. 333

3. Alternative 3. Primary Use Alternative: Identify commercial forest lands where timber production and harvest are the primary use, and exclude these areas from livestock utilization. 333

TABLES

Page No.

1. General characteristics of American Indian persons on the Flathead Reservation: 1980 22

2. Economic characteristics for American Indian persons, Flathead Reservation: 1980 23

3. Labor force status, 16 years old and older, Flathead Reservation: January 1983 24

4. Economic characteristics for Lake County residents: 1980 . . 25

5. Class of worker and industry, Lake County: 1980 26

6. Employment in the wood products industry (including logging), Lake and Sanders Counties: 1978-1982 27

7. Approximate percentage of total employment and earnings from the wood products industry, Lake and Sanders Counties: 1978-1981 28

8. Volume of timber cut and value of stumpage from tribal and allotted land, free use by Indians, with and without permit: 1979-1982 29

9. Volume of timber cut and gross value of stumpage, tribal and allotted lands, Flathead Reservation: 1979-1982 30

10. Gross tribal income by source: 1983 31

11. Approximate areal extent of common habitat series on the Flathead Indian Reservation (pp. 11-12, Flathead Management Plan) 33

12. Summary of forest habitat types on Flathead Indian Reservation 34

13. List of habitat types by productive potential and precipitation 42

14. Generalized soil map key for forested part of Flathead Indian Reservation 68

15. Evaluation of character subtypes, Flathead Indian Reservation 94

FIGURES

Page No.

1. Environmental Assessment and Determination of Significance 2

2. Flathead Indian Reservation -- Forest Management Planning Process 3

3. Forested Areas of the Flathead Indian Reservation 4

4. Generalized Soil Map of the Flathead Indian Reservation . . . 67

INTRODUCTION

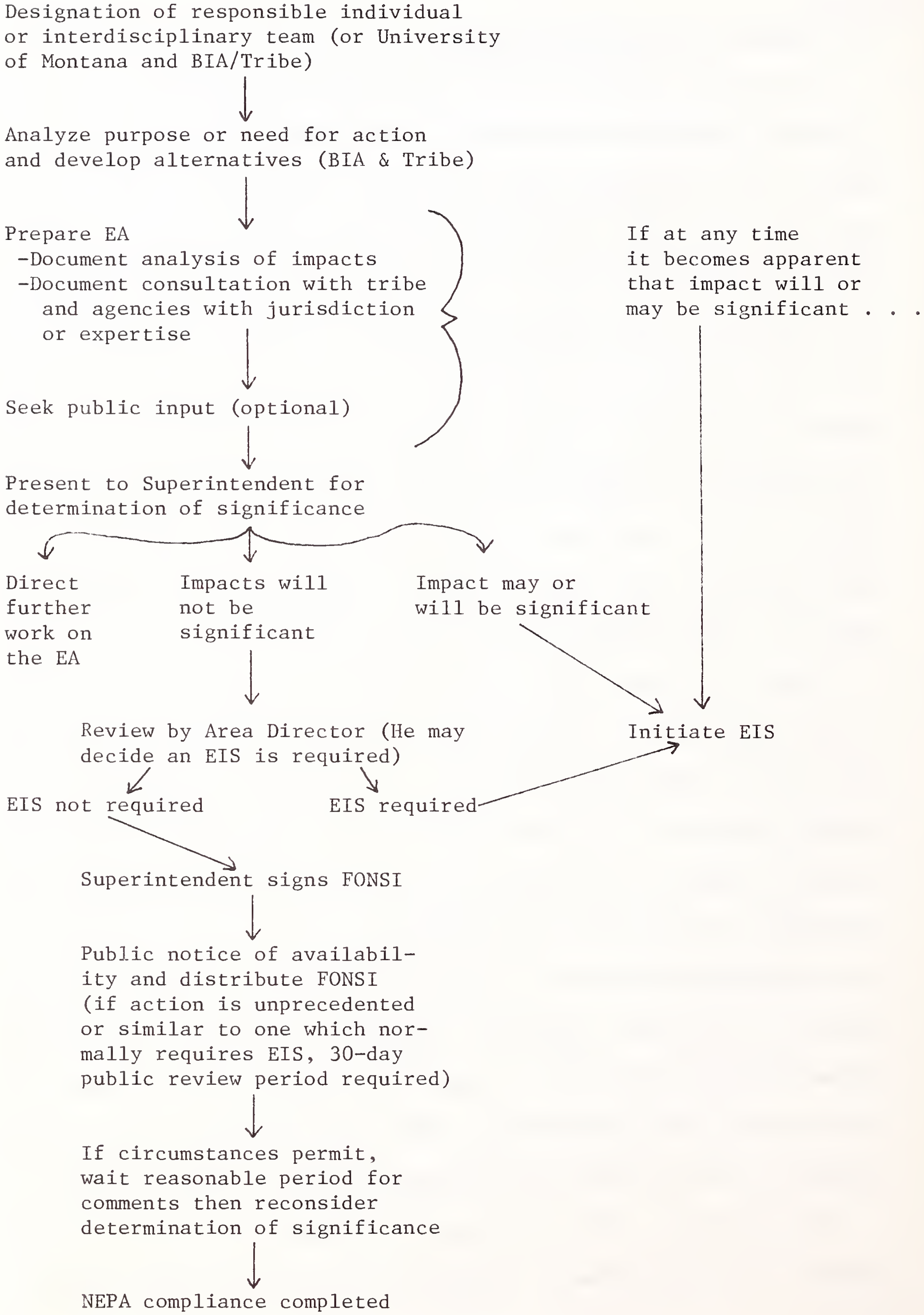
A. Purpose of and Need for Action

The primary purpose of the Environmental Assessment (EA) is to provide an analysis for determining whether implementation of the proposed Forest Management Plan will have a significant impact on the quality of the human environment. Both 30 BIAM Supplement 1 and the National Assessment require that an environmental analysis be prepared for Reservation Forest Management Plans. If the Superintendent or the Portland Area Director conclude, after the EA and draft plan have passed the review and comment procedure, that the impact may or will be significant, an Environmental Impact Statement (EIS) will be initiated. If he concludes impacts will not be significant, the Superintendent will sign a FONSI ("Finding of No Significant Impact"). This procedure is outlined in Figure 1.

Every ten years, the Forestry Branch of the Bureau of Indian Affairs (BIA) for the Flathead Indian Reservation revises various aspects of the forest management plan. The purpose of the forest management planning is to provide the guidance required to effectively manage the forest land resource of the reservation. Effective forest management is management that accomplishes the goals and objectives of the Confederated Salish and Kootenai Tribes and the Bureau of Indian Affairs. The forest management planning process at the Flathead Indian Reservation has been a cooperative endeavor involving both the Confederated Salish and Kootenai Tribes and the BIA. The planning process for the 1982-1991 Forest Management Plan is shown in Figure 2.

On January 25, 1982 the Branch of Forestry met with the Tribal Council to discuss goals, objectives, and basic forest policy.

ENVIRONMENTAL ASSESSMENT AND DETERMINATION OF SIGNIFICANCE


Designation of responsible individual or interdisciplinary team (or University of Montana and BIA/Tribe)
Analyze purpose or need for action and develop alternatives (BIA & Tribe)
Prepare EA
-Document analysis of impacts
-Document consultation with tribe and agencies with jurisdiction or expertise
Seek public input (optional)
If at any time it becomes apparent that impact will or may be significant . . .
Present to Superintendent for determination of significance
Direct further work on the EA
Impacts will not be significant
Impact may or will be significant
Review by Area Director (He may decide an EIS is required)
Initiate EIS
EIS not required
EIS required
Superintendent signs FONSI
Public notice of availability and distribute FONSI (if action is unprecedented or similar to one which normally requires EIS, 30-day public review period required)
If circumstances permit, wait reasonable period for comments then reconsider determination of significance
NEPA compliance completed

FROM: 30 BIAM Supplement 1.

Figure 1.

FLATHEAD INDIAN RESERVATION
FOREST MANAGEMENT PLANNING PROCESS

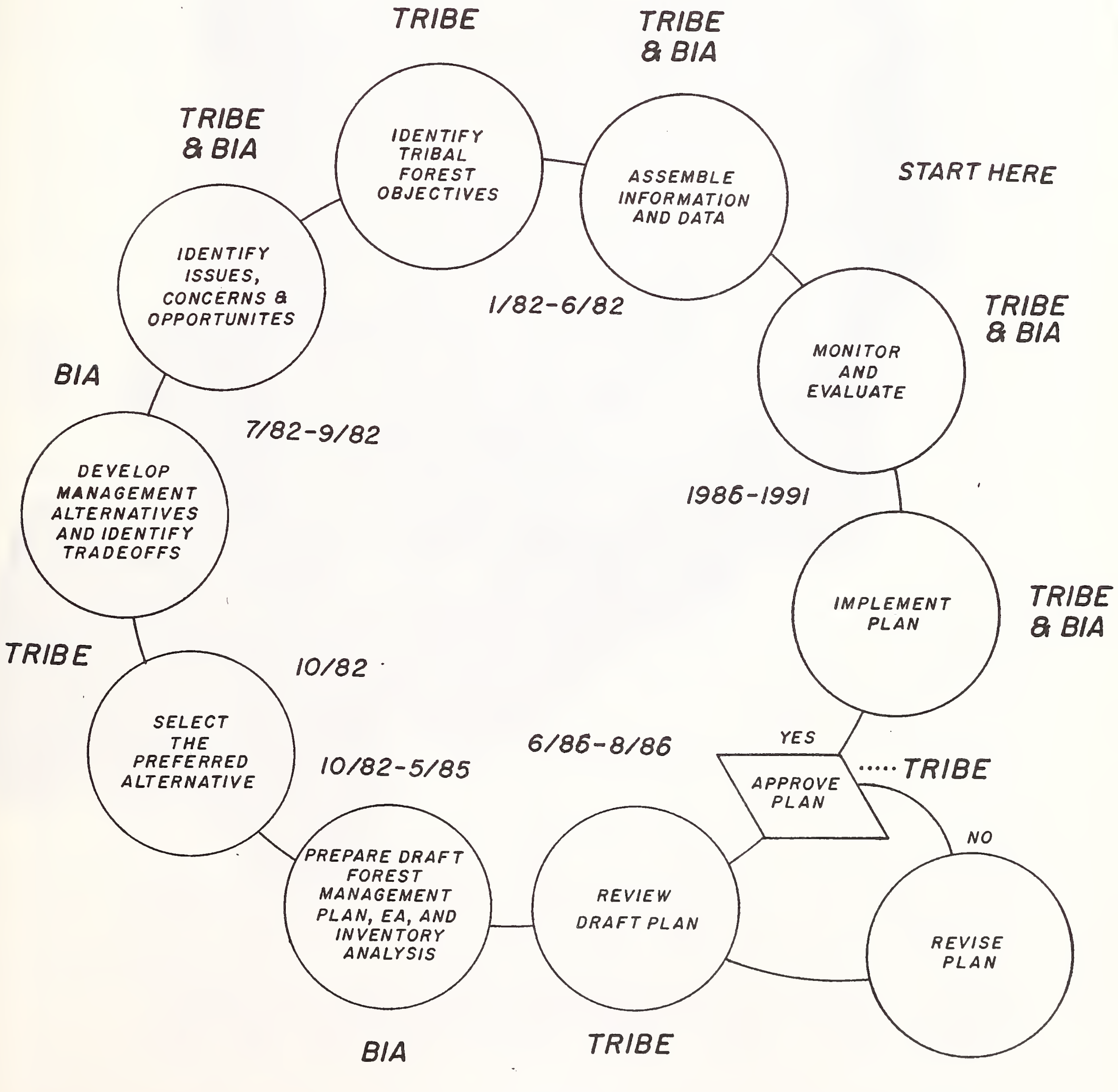

TRIBE
TRIBE & BIA
TRIBE & BIA
START HERE
IDENTIFY TRIBAL FOREST OBJECTIVES
ASSEMBLE INFORMATION AND DATA
IDENTIFY ISSUES, CONCERNS & OPPORTUNITES
1/82-6/82
TRIBE & BIA
MONITOR AND EVALUATE
BIA
7/82-9/82
DEVELOP MANAGEMENT ALTERNATIVES AND IDENTIFY TRADEOFFS
1986-1991
IMPLEMENT PLAN
TRIBE & BIA
TRIBE
10/82
SELECT THE PREFERRED ALTERNATIVE
10/82-5/85
6/86-8/86
YES
APPROVE PLAN
TRIBE
NO
PREPARE DRAFT FOREST MANAGEMENT PLAN, EA, AND INVENTORY ANALYSIS
REVIEW DRAFT PLAN
REVISE PLAN
BIA
TRIBE
BIA

Figure 2

FROM: 53 BIAM SUPP. 2
PORTLAND AREA ADDENDUM 3.2 C (4)(a)

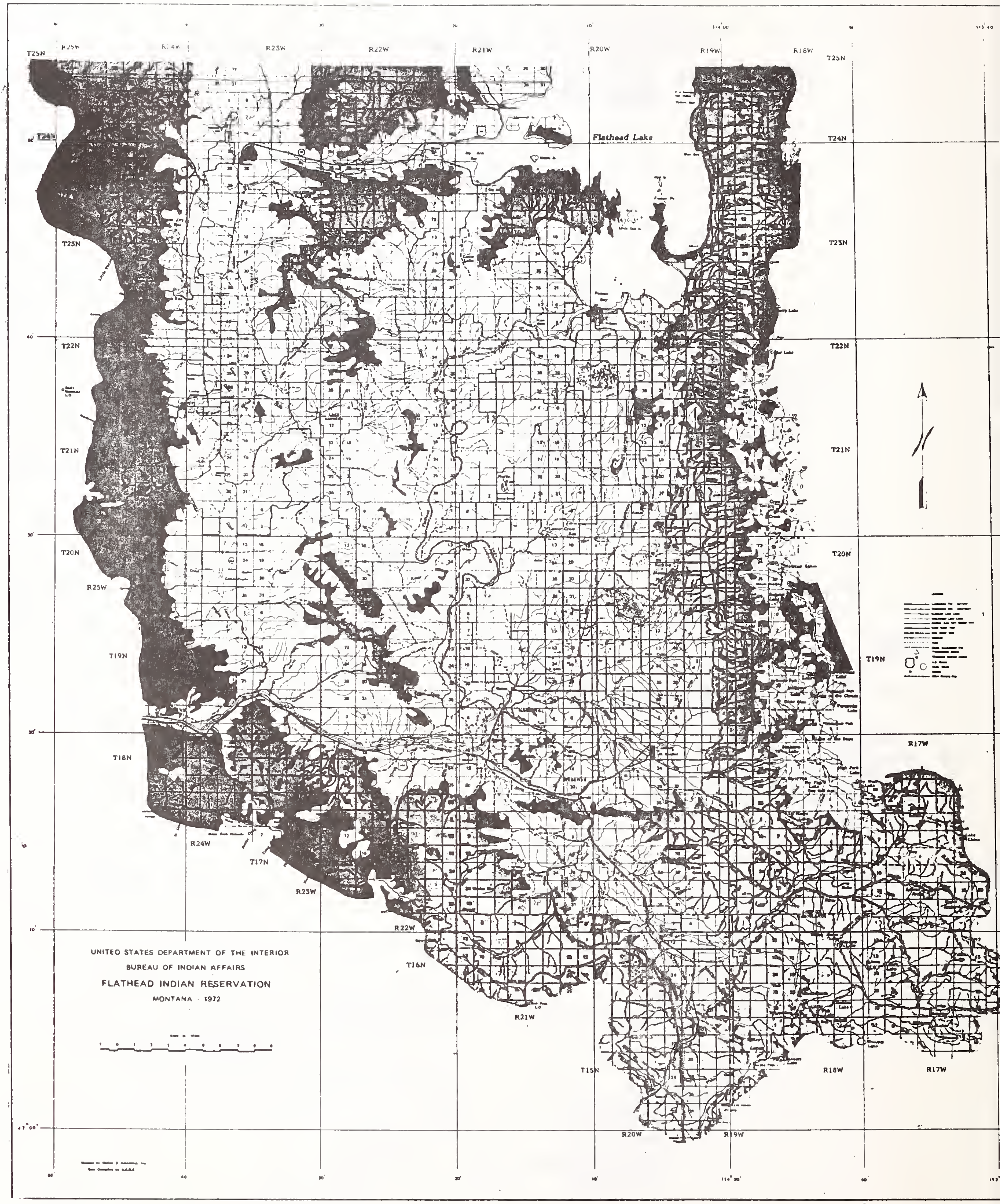


Figure 3. Forested Areas (shaded) of the Flathead Indian Reservation.

Various members of the Branch of Forestry began writing the draft plan. In June 1982 the planning effort continued with forester Jim Stires, Billings Area Office, visiting the Flathead Agency. Mr. Stires outlined the tasks and projected time frames for the planning effort. The University of Montana was selected as the contractor to prepare the Environment Assessment (EA) for the plan. A scoping committee was formed to identify forest management issues and concerns for the EA team. Participants in the scoping process included: Forest Manager, Forestry Section Heads, Branch of Wildlife, Branch of Land Services, Tribal Council, Tribal Forest Management Enterprise, and Tribal Natural Resources Department. Alternatives were developed for sensitive management concerns such as precommercial thinning, use of herbicides, even-age cutting block size, and slash disposal. The Tribal Council reviewed the alternatives and selected a preferred alternative. In October of 1982 the Council also reviewed and approved the Management Objectives and Goals for the 1982-1991 Forest Management Plan.

During the fall of 1982 the Branch of Forestry prepared the draft Forest Management Plan in light of the preferred alternatives and management objectives selected by the Tribes. On January 17, 1983 the draft plan was given to the University, and the EA team began preparing the assessment of the plan.

A major characteristic of this EA is that the discussion of the impacts tends to be general in nature and broad in amplitude. This was a consequence of two factors. First, many EA's are site specific, meaning the management action pertains to a certain area or location where most site characteristics (slope, aspect, timber volume, wildlife usage) are constant. However, this EA covers the entire reservation, thus encompassing many ecological and topographical diversities. Therefore, in order to account for all possible environmental impacts, the EA team tended to keep the assessments general, delving into specifics only when certain environmental components would be affected. Secondly, in order for the authors of an EA to describe management impacts on a resource in qualitative terms, a substantial data base is required. The data base supplied by the Flathead Agency in Pablo was limited in many areas, thus causing the authors to describe the impacts in general terms rather than submitting specific assessments that they could not substantiate with reliable data. A list of the information sources provided by the Agency, including the names of BIA and Tribal contacts, is contained in the Appendix.

B. Objective of the Environmental Assessment

The basic objective for this EA is to evaluate the preferred alternatives of the 16 management policies stated in the contract and presented in the management plan from the aspect of the following list of reservation resources:

1) Geology, Minerals and Topography
2) Surface Hydrology
3) Range
4) Soils
5) Timber and Other Vegetation
6) Wildlife
7) Wilderness
8) Fisheries
9) Recreation
10) Human and Community Developments
11) Threatened and Endangered Species
12) Ecological Interrelationships

In addition, separate chapters were written describing the collective impacts of all the management concerns on the cultural and archaeological resources and the aesthetic resources of the reservation. This was done because stratification by management concern would prove repetitive and inefficient. This procedure is a modified version of the one stated in the original contract.

The EA also contains an abbreviated synopsis or summary of the Flathead Indian Reservation's natural and cultural resources. This summary provides the reader information needed to understand the impact assessments.

C. List of Contributors

This EA was developed as follows: For each resource topic, a specialist was employed to assess the impacts on that resource for every management concern. The impacts assessed were only those from the identified preferred alternatives in this document per contract modification. This method provided diverse and state-of-the-art assessments needed for a complete discussion of management impacts. The following list of contributors represents the collection of professions employed in the construction of the Environmental Assessment.

	Area of Expertise	Contribution
Dr. Donald J. Bedunah	Range Resources	Range
Dr. David H. Jackson	Forest Economics	Human and Community Developments (Economic)

Dr. Kathleen Jackson	Political Science	Social and Economic Setting
Dr. Carling I. Malouf	Archaeology	Archaeological and Cultural Setting
Dr. C. Leslie Marcum	Wildlife	Endangered Species and Wildlife
Dr. John M. McQuiston	Sociology	Human and Community Developments (Sociological)
Dr. Stephen F. McCool	Recreation	Recreation Aesthetics
Dr. Thomas J. Nimlos	Forest Soils	Soils Physical and Biological Setting
Dr. W. Leslie Pengelly	Wildlife	Endangered Species and Wildlife
Dr. Donald F. Potts	Hydrology	Surface Hydrology
Dr. Steven W. Running	Tree Physiology	Timber
Dr. Arnold J. Silverman	Geology	Geology
Dr. Jack Stanford	Ichthology	Fisheries
Dr. Nellie M. Stark	Forest Ecology	Soils, Ecological Inter-Relationships, Physical and Biological Setting
Ken Wall	Wilderness Management	Wilderness
Dr. Ronald Wakimoto	Fire	Forest Fire Suppression
Dr. E. Earl Willard	Range Resources	Range

Format of the Environmental Assessment

The assessment has been designed so it may be used as a handbook for Tribal and BIA personnel to quickly and efficiently research the impacts on a resource for any management concern. The information in each chapter is independent of the other chapters, thus facilitating efficient usage by constant reference to the table of contents.

The EA is divided into two parts with the first part containing five chapters. The first chapter of the first part is introductory material. The second and third chapters of the first part briefly describe the Flathead Indian Reservation's valuable resources in terms of the social and economic setting, and the physical and biological setting. The last two chapters of the first part present the collective impacts of all identified preferred alternatives on the archaeological and cultural resource and the aesthetic resource.

The second part of the EA is the heart of the document. It presents the impact for each management concern by resource topic. Each of the 16 subunits of the second part is dedicated to a specific management concern. Every subunit begins with a background section describing management policy and problems thus far experienced by the BIA Forestry Department. Then each subunit is separated into 11 distinct sections where each section deals solely with a certain resource topic. Each one of the resource sections is then broken down into three sub-sections. The first sub-section describes the specific environment which will be affected by that management concern within the resource topic. The second and third sections present the direct impacts and indirect impacts, respectively, of the management concern on that resource topic.

Management concerns with the Proposed Alternative are discussed by the scientists in the assessment. The Proposed Alternative is a concise statement of proposed policy for the 1982-1991 Forest Management Plan. For further information the reader should refer to the management plan. A guide for locating each management concern in the draft plan is in Appendix D.

The Environmental Assessment, then, is a product of 16 scientists from various fields of environmental expertise, using a limited data base to assess the potential impacts of 16 management policies from the aspect of 11 resource topics. Discussion of the impacts refers to specific areas or examples only when data were substantial; otherwise, general or broad statements were presented. Areas where scientific information is lacking are pointed out within the document.

The University of Montana interdisciplinary team addressed the Proposed Alternatives as required by the contract. Additional alternatives required by NEPA have been developed and analyzed by BIA Flathead Agency staff. Discussion of these alternatives is attached to this document as a separate report.

SOCIAL AND ECONOMIC SETTING

The Flathead Reservation of Montana was established by the Treaty of Hell Gate in 1855 as a homeland for the Pend d'Orielle, Kootenai, and later, for the Salish people from the Bitterroot Valley. The boundaries of the reservation as established by survey encompass some 1,248,000 acres. Approximately half of the original parcel was transferred to non-Indian ownership under the allotment policy of the federal government--a process that spanned the period between 1887 and 1934 and included opening of the reservation to white settlement. Today, the U. S. government holds title to some 620,000 acres in trust status for the Confederated Salish and Kootenai Tribe that include 570,000 acres of tribal land and 49,000 acres of individual tribal allotments.[1] The remainder of the land within the reservation's exterior boundaries is either private, fee patent land or U. S. Department of Interior and State of Montana lands. The majority of tribal land is located in the outer periphery. This is basically the forested mountain areas while the valley agricultural land is, for the most part, in non-Indian ownership.

Within the State of Montana's political jurisdictions, the Flathead Reservation is located within the geographic boundaries of four counties: Flathead, Lake, Missoula, and Sanders. Census figures for 1980 shown in Table 1 indicate that the majority, or 87% of the reservation's populations of 19,628 persons reside within Lake County. Persons classified as American Indian (3,771) constitute only 19% of the total reservation population.

---

[1] "Flathead Reservation Class I Air Quality Redesignation" prepared for the Confederated Salish and Kootenai Tribes, October 15, 1980, pp. 20-21.

The socio-economic and political environment of the Flathead Reservation is a complex one. While the Salish and Kootenai are in a minority as reservation residents, they are major landowners, albeit the status of their land as trust land means that the Bureau of Indian Affairs and the Secretary of the Interior have major administrative responsibility for land management. The location of tribal land and the forest resources contained thereon are important considerations. The mountains ringing the reservation provide a great deal of the aesthetic appeal of the area for residents and visitors. The entire reservation contains important resources such as game animals and watersheds that are not restricted to tribal lands. Thus, management alternatives which affect tribal lands should also be considered in the larger context of the reservation.

Employment and Income Distribution

Tribal employment and income statistics provide a partial picture of the socio-economic setting of the reservation. Data from the 1980 census and from the Bureau of Indian Affairs are available for analysis of selected characteristics of Indian residents of the reservation. Census data presented in Table 2 indicate a 20% rate of unemployment for tribal members 16 years of age and over. This rate is high when compared with the state of Montana rate of 5%, but is not out-of-line with that of other Montana reservations.[2] Data are not available for non-tribal members on the reservation. Unemployment appears even higher in a January 1983 report of the BIA (Table 3) where it was estimated that 31% of those 16 and over and able to work were unemployed. Some of these individuals, of course, are not seeking employment. Allowing for differences in data collection methods, both sources suggest a relatively high rate of unemployment among tribal members.

Census surveys of persons whose poverty status was determined indicate that 40.5% of Flathead Indian Reservation residents' incomes were below the poverty level. BIA data include an estimate of those employed in both full-time and part-time jobs who earn $7,000 or more. For the Flathead Indian Reservation this represents 48%, or 359 individuals. However, these figures may be misleading, since tribal members pay no state taxes, are provided health benefits, and benefit from tribal membership that reduces the cost of living.

The economic characteristics of the tribal reservation residents are perhaps more meaningful when viewed in comparison with their neighbors. Lake County data (where 90% of the Indian population resides) indicate quite distinct employment and income differences between Indian and White populations. Thus, while almost identical proportions of both populations are included in the labor force, the unemployment rate for Indians is more than double that of their White counterparts (Table 4). This disparity may be the result of factors in addition to availability of jobs. Indian household income is 30% lower and Indian family income 30% lower than comparable White groups. However, since the Indians receive additional financial benefits from being tribal members, their lower income level may be misleading. Finally, the proportion of Indian individuals whose incomes were below the apparent poverty level was three times that of comparable White individuals.

---

[2] Blackfeet Reservation, 14.7%; Crow Reservation 35.2%; Ft. Belknap, 8.9%; Fort Peck, 25.2%; Northern Cheyenne, 15.7%; Rocky Boy's Reservation, 11.3%. Source: Table 193, U. S. Bureau of the Census, 1980 Census of population. "General Social and Economic Characteristics". Report PC80-1-C28. Montana. U.S.G.P.O., Washington, D. C.

There were no available data which related specifically to the tribal population of the reservation to provide a breakdown of employment by class of worker or industry. Once again, Lake county data are useful to obtain a profile of various sources of reservation employment and to suggest possible explanations for the observed differences in economic indicators. The relative importance of government programs for tribal employment is suggested in Table 5. Of those Lake County Indian residents employed, over half were government employees. This pattern of mostly government employment was not repeated for the White population where most of the workers are employed in the private sector.

In addition to public administration, the combination of agriculture, forestry, fisheries and manufacturing (which includes workers in the wood products industries) provides the major source of Indian employment. The latter category is also a major employment source for White workers. It should be noted that census data may under-report the forest-related employment due to classification of woodlands workers under the transportation or self-employed categories. Tables 6 and 7 provide better estimates of the employment, income and relative importance of forest-related industries to the area surrounding and including the reservation. However, it is not possible to identify the Indian employment from these data.

More refined data on forest related tribal employment is elusive. The BIA forestry program, the tribally owned post and pole yard at Dixon, and one privately owned area mill employ approximately 55 full-time and 251 seasonal Indian workers.[3] No estimates of individual wage earnings from these employment sources are available. However, the draft of the 1983 Flathead Forest Management Plan includes aggregated totals of individual Indian income from wages earned from forest related employment for a nine-year period.[4] It is notable from that table that wage income from both tribal and federal sources declined considerably from 1980.

It is difficult to gauge income from self-employment and other activities which generate income. For example, the tribal government has for over forty years allowed tribal members with and without permits to harvest Christmas trees, from tribal forests.[5] The importance of permitted harvesting of timber by Indians on the reservation

---

[3] September, 1983 telephone conversations with representatives of the BIA Forestry Program, Tribal Post and Pole Yard and one area mill. Another mill would not disclose employment statistics by race of employee.

[4] 1983 Flathead Forest Management Plan, Draft, p. 160.

[5] Historical Research Associates, "Timber, Tribes, and Trust". Missoula, Mt., May, 1977, pp. 225-236.

(volume of timber and stumpage value) is shown in Table 8 for the years 1979-1983. This activity is a source of self employment and income. It is unknown how many individuals or families benefit from those resources or how much income they derive. Likewise, the availability of food products from traditional subsistence activities such as hunting, fishing and gathering on reservation lands provides another source of income which cannot be accurately determined.

The socio-economic profile of the reservation setting that emerges from the employment and income data represents a period of recession in the economy as a whole and the wood products industry in particular. It appears that the major employment sources for the reservation are controlled by external events. In the case of government jobs, shifts in policy set at the national level affect the budgets of federal programs, many of which are administered by the Tribes. In the case of the wood products industry, production is largely in response to market conditions external to the reservation.

Reservation Resources and Tribal Government

All of the land within the exterior boundaries of the Flathead Reservation, even land owned by non-Indians and incorporated communities, is classified as "Indian Country".[6] The meaning of the term for the Flathead Reservation was clarified in a 1982 Supreme Court ruling.[7] At issue was tribal regulatory power over privately owned docks on the southern part of Flathead Lake and the larger issue of whether the reservation had been disestablished by the Flathead Act of 1904 that paved the way for White settlement within the reservation. The Court upheld tribal claims to ownership in trust status of the bed and banks of that part of the Flathead Lake originally conveyed under the Treaty. The Court affirmed the regulatory powers of the Tribes over the manner in which non-Indian land owners adjacent to the lake exercise their riparian rights. This decision thus paved the way for tribal regulation of lakeshore development of one of the reservation's most appealing recreational areas.

---

[6] William C. Canby, Jr., American Indian Law (St. Paul, Minn.: West Publishing Co., 1981), pp. 91-92.

[7] Polson, Montana v. Confederated Salish and Kootenai Tribes of Flathead Reservation (CA9, 665 F 2D 951).

Political jurisdiction over the reservation territory resides with the Confederated Salish and Kootenai Tribal government. According to the Constitution and Bylaws of the Tribes, a Tribal Council consisting of ten councilmen representing eight districts is the governing body.[8] Biannual elections are conducted and legal residents of the reservation for at least one year who are 21 years of age or older and tribal members are eligible to vote. Powers of the Tribal Council include the powers:

> to regulate the uses and disposition of tribal property, to protect and preserve the tribal property, wildlife and natural resources of the Confederated Tribes ... and to approve or veto any sale, disposition lease, or encumbrance of tribal lands and tribal assets which may be authorized or executed by the Secretary of the Interior, the Commissioner of Indian Affairs, or any other agency of government...[9]

---

[8] James J. Lopach, Margery H. Brown and Kathleen Jackson, "Tribal Constitutions: Their Past-Their Future", Missoula, Mt: Bureau of Government Research, August, 1978, pp. 20-29.

[9] Ibid., 23-24.

Within the last few years, the Tribal Council has made several significant decisions which have had the effect of exercising their jurisdictional powers and of shaping the conditions for the future development of tribal resources. One such decision was the resolution adopted in July of 1979 to request reclassification of the air quality on the Flathead Reservation from Class II to Class I. This action was sought "to maintain the existing high quality air and to preserve the scenic beauty and natural resources of the area; and to control industrial development on the Reservation which otherwise might contribute significantly to a reducton of air quality."[10] According to the impact assessment which accompanied the application, advantages far outweighed potential disadvantages of any loss of jobs, incomes and tax base associated with major industrial development of the area. The Class I designation, which was granted in May, 1982, has significance because of the stringent standards it imposes upon sources which emit pollutants. Further, the Flathead Reservation is distinguished, along with the Northern Cheyenne Reservation, as one of the few non-wilderness areas in the country with a recognized pristine airshed.

The creation of the Mission Mountain Tribal Wilderness area is another example of a tribal choice which affirmed commitment to a high quality environment and to the preservation of cultural and spiritual values associated with the land. This management choice may have resulted in the forfeiture of potential income to be derived from development of extractive resources. Tribal opposition to the location of high voltage transmission lines through the Reservation as part of an energy corridor stretching from Colstrip in Eastern Montana to the Pacific Northwest is yet another example of environmental concern and exercise of tribal prerogatives concerning land use.

---

[10] Air Quality Redesignation, p. 1.

The balance between environmental, cultural and economic priorities where development of tribal resources is concerned has not been without controversy. In mid-1981 after several years of refusal to negotiate with representatives of the Northern Tier Pipeline, an agreement was struck which would allow the pipeline to cross the reservation in exchange for some $27 million in cash plus yearly rental payments. This agreement, which was approved by a narrow margin in a tribal referendum, never culminated due to the blockage of the pipeline by the State of Washington. This action along with the tribal election campaign where development of tribal resources to provide jobs was an issue, seem to mark a shift in tribal sentiment.[11]

Tribal resource development is linked to external sources of economic well-being. In 1981 as part of the Reagan administration's budgetary cuts, several programs which provided major economic assistance to the Tribes were cut. Among these were the Economic Development Administration (EDA) grants that had provided funding assistance for reservation projects including the Tribal Post and Pole Yard. The Young Adult Corps Center and the Comprehensive Employment Training Act (CETA) budgets were also reduced and that meant a major loss of employment opportunities for tribal youth. These federal cutbacks occurred at a time when the other major source of reservation employment, the wood products industry, was also in a state of decline. One indication of the extent to which individuals on the reservation were affected appeared in a Missoulian article in March of 1982. It was announced then that the BIA emergency aid fund was depleted. This fund was established to provide aid to enrolled tribal members as "a last resort" after all other sources of assistance such as unemployment compensation had been exhausted. The number of eligible recipients for BIA assistance had doubled from the previous year.[12]

---

[11] Missoulian, November 28, 1981.

Timber has long been the major tribally controlled economic resource. Timber is also an unstable source of tribal income as is demonstrated by the data in Table 9 showing the volume and value of timber sales contracts for the last four-year period. Great volatility in annual harvest and income from timber harvest are indicated. The 1982 harvest volume was about two-thirds the 1979 level of harvest and the value of the 1982 harvest fell over 300% from the 1979 level.

Table 8 represents the volume and value of timber made available to tribal members under timber cutting permits. In 1982, timber from tribal forests harvested under those permits constituted 26% of the total volume harvested compared with 9% of the total harvest in 1979. In order to calculate the value of that harvest, stumpage rates must be considered. The estimated stumpage rate for free use permits is considerably lower than the stumpage price for contract sales (for instance, \$28.68 compared to \$83.03 in 1982).[13] Therefore, the value of the stumpage as a percent of tribal timber income is lower than the percent of tribal harvest. In the last few years, free use permits have become more important as the market for timber dwindled.

---

[12] Missoulian, May 14, 1982, 12:1-4.

It is clear that tribal income from timber receipts has fluctuated significantly in the last ten years. Income from tribal timber amounted to some \$5 million and represented 72% of total gross tribal income in 1973.[14] By marked contrast, in 1983, estimated timber receipts totalled only \$1.3 million and constituted only 24% of the gross tribal income (Table 10). This in part reflects the depressed markets for timber and in part the relative and absolute increase in the importance of other stable sources of income.

---

[13] Summary Table, 1982 Annual Report of Timber Cut, Bureau of Indian Affairs, Flathead Agency, Montana.

[14] Leo K. Cummins, "Flathead Indian Reservation Forest Land: An Environmental Assessment". The Confederated Salish and Kootenai Tribes of the Flathead Reservation, Pablo, Montana, April, 1974, p. 9-12.

Table 1. General characteristics of American Indian persons on the Flathead Reservation: 1980.

		Counties			
	Flathead Reservation	Flathead	Lake	Missoula	Sanders
Total Persons	19,628	30	17,058	653	1,887
Total American Indian	3,771	4	3.140	283	344
Percent of total persons	19.2	13.3	18.4	43.3	18.2
Male	1,985	----	1,646	153	183
Female	1,786	----	1,494	130	161
Under 5 years old	412	----	349	26	37
Age 5-17	1,157	----	965	100	92
Age 18-64	1,992	----	1,658	142	188
65 years and older	210	----	168	15	27
16 years and over	2,444	----	2,036	172	232
Median age	21.1	----	20.7	20.9	25.7
Families:					
Married-couple	573	----	457	45	69
Female householder, no husband present	209	----	185	13	11
Persons per household	3.50	----	3.50	4.03	3.18

Source: 1980 Census of the Population, Vol. 1, Characteristics of the Population, Chapter B. U. S. Dept. of Commerce, Bureau of the Census, March 1982.

Table 2. Economic characteristics for American Indian persons, Flathead Reservation: 1980.

Percent in Labor Force*	
Male, 16 Years and Over	63.0%
Female, 16 Years and Over	44.8%
Civilian Labor Force	
Percent Unemployed	20.0%
Families	
Total	688
Percent with No Workers	17.0%
Median Income (1979 Dollars)	
Household	$10,439.00
Family	$10,826.00
Per Capita Income (1979 Dollars)	$ 3,129.00
Income in 1979 Below Poverty Level	
Total Persons--Poverty Status Determined	1,401
Percent Below Poverty Level	40.5%

Source: U. S. Bureau of the Census. 1980 Census of Population. General Social and Economic Characteristics. Report PC 80-1-C29. Montana. U. S. G. P. O., Washington, D. C.

*Figures do not add to 100%. Proportions are based on ratio of males in labor force to male population 16 years and over, and females in labor force to female population 16 years and over.

Table 3. Indian labor force status, Flathead Reservation, January 1983

		Number	Percent of Total
Population 16 years - 65 years		1548	100%
[1]Unable to work		456	29%
[2]Employed		752	49%
Not employed, able to work		340	22%
Potential Labor Force 16 years - 65 years			
Able to work		1092	100%
Employed		752	69%
Not employed		340	31%
Seeking work	301		
Not seeking work	39		

[1] Includes 112 students, 344 others.

[2] Includes 359 persons who earned $7000+, the annual income of a worker earning minimum wage. This represents 24% of the labor force in th 16-65 population.

Source: Bureau of Indian Affairs, "Indian Service Populations and Labor Force Estimates." January 1983.

Table 4. Economic characteristics for Lake County residents: 1980.

	Race	
	White	Indian
Persons 16 Years and Over	11,661	2,053
Percent in Labor Force	53.2%	54.2%
Civilian Labor Force	6,205	1,112
Percent Unemployed[1]	8.3%	20.1%
Families		
Total	4,523	606
Percent with No Workers	17%	17%
Median Income		
Household	$12,651	$10,313
Family	$15,134	$10,650
Per Capita Income	$ 5,873	3,162
Income in 1979 Below Poverty Level		
Total Persons-- Poverty Status Determined	2,264	1,320
Percent Below Poverty Level	14.4%	42.6%

Source: U. S. Bureau of the Census. 1980 Census of Population. General Social and Economic Characteristics. Report PC 80-1-C28. Montana. U. S. G. P. O., Washington, D. C.

[1] These data include those individuals that may not be actively looking for work.

Table 5. Class of worker and industry, Lake County: 1980.

	White	Percent of Total	Indian	Percent of Total
Class of Worker				
Employed Persons 16 Years and Over	5,693	100	889	100
Private Wage and Salary Workers	3,077	54	336	38
Federal Government Workers	466	8	328	37
State Government Workers	182	3	20	2
Local Government Workers	720	13	107	12
Self-Employed Workers	1,172	20	86	10
Unpaid Family Workers	76	1	12	1
Industry				
Agriculture, Forestry, and Fisheries	951	17	117	13
Mining	8	–	2	1
Construction	505	9	37	4
Manufacturing*	492	9	74	8
Transportation	303	5	30	3
Communications and Public Utilities	116	2	13	1
Wholesale Trade	106	2	12	1
Retail Trade	937	16	77	9
Banking and Credit	149	3	3	–
Insurance, Real Estate and Other Finance	117	2	–	–
Business and Repair Services	191	3	6	1
Private Households	10	–	–	–
Other Personal Services	133	2	16	2
Entertainment and Recreation	48	1	18	2
Professional and Related	1,210	21	166	19
Public Administration	417	7	318	36
Total	5,693	100	889	100

*Includes 298 White and 50 Indian workers in wood products industries.

Source: U. S. Bureau of the Census. 1980 Census of Population. General Social and Economic Characteristics. Report PC 80-1-C28. Montana. U. S. G. P. O., Washington, D. C.

Table 6. Employment in the wood products industry (including logging), Lake and Sanders Counties: 1978-1982.

Year	Lake	Sanders	Both Counties
1978	452	460	912
1979	477	436	913
1980	405	441	846
1981	434	405	839
1982	422	330	752

Note: Includes only those wage and salary workers covered by unemployement insurance. Self-employed persons are excluded.

Source: Montana Department of Labor and Industry, Employment Security Division. Unpublished data.

Made available by Bureau of Business and Economic Research, University of Montana, Missoula, Montana.

Table 7. Approximate percentage of total employment and earnings from the wood products industry, Lake and Sanders Counties: 1978-1981.

Year	Employment		Earnings	
	Lake	Sanders	Lake	Sanders
1978	10.0	16.0	12.2	22.6
1979	10.6	15.1	12.6	20.5
1980	9.1	14.8	10.8	20.3
1981	9.5	14.4	11.0	19.5

Notes: Data are based on figures for all manufacturing; there is practically no manufacturing in either county other than the wood products industry. Earnings are defined as all income received from participation in the labor force--wages, salaries, proprietors' income, and other labor income.

Source: U. S. Department of Commerce, Bureau of Economic Analysis. Unpublished Data

Made available by Bureau of Business and Economic Research, Univeristy of Montana, Missoula, Montana.

Table 8. Volume of timber cut and value of stumpage from tribal and allotted land, by Indians, timber cutting permit: 1979-1982.

Year	Volume M. Ft. BM	Percent of Total Volume of Harvest	Value[1]	Total Permit Value as Percent of Total Tribal Timber Value Cut
1979	2,711	9%	$ 26,828	1%
1980	4,814	24%	$108,102	5%
1981	4,599	22%	$134,325	8%
1982	4,780	26%	$137,100	11%
1983	4,040	16%	$109,152	6%

Source: Bureau of Indian Affairs, Flathead Agency, Montana. From summary tables, 1978-1982 Annual Reports of Timber Cut.

[1] Current dollars.

Table 9. Volume of timber cut and gross value of stumpage, tribal and allotted lands, Flathead Reservation: 1979-1982.

Year	Volume M. Ft. BM	Value[1]
1979	29,718	4,021,221
1980	20,376	2,057,089
1981	21,006	1,586,085
1982	18,683	1,249,519
1983	25,853	1,858,355

Source: Bureau of Indian Affairs, Flathead Agency, Montana. From summary tables, 1978-1983 Annual Reports of Timber Cut.

[1] Current dollars.

Table 10. Estimated Gross tribal income by source: 1983.

Source	Amount*	Percent of Total
Interest	575,000	10%
Timber Receipts	1,300,000	24%
Kerr Dam Rental	2,600,000	47%
Land Leases	245,000	4%
Business Leases	200,000	4%
Miscellaneous	602,000	11%
Total	5,522,000	100%

Source: Fred Houle, Tribal Secretary, Confederated Salish and Kootenai Tribes of the Flathead Reservation.

*These data were compiled prior to the end of the fiscal year ending September 30, 1983. Actual income may vary from these projections.

PHYSICAL AND BIOLOGICAL SETTING

Biota

Flora. The Management Plan states: "It will be the policy of the Branch of Forestry to use habitat types, as a major tool in developing silvicultural and management prescriptions for the Flathead Reservation." Thus, land stratification by habitat types is a very important element in forest land management. A habitat type includes all land areas potentially capable of supporting similar plant communities of climax (Pfister et. al., 1977).

The dominant habitat series on the Reservation are the Douglas-fir (*Pseudotsuga menziesii*) series. This is demonstrated in Tables 11 and 12. Table 11 is a summary of common habitat series from Continuous Forest Inventory data (Section III. D.1. of the Forest Management Plan); it shows that two-thirds of the forested part of the Reservation supports habitat series in which Douglas-fir is one of the dominant climax tree species. The other two common series are those in which grand fir (*Abies grandis*) and subalpine fir (*Abies lasiocarpa*) are common climax tree species.

Table 12 summarizes the extensive habitat types on the Reservation by groups created by the Forestry branch of the Bureau of Indian Affairs. The environment varies from very dry and warm at low elevations to very cold at high elevations, near timberline. Plant growth forms generally vary from ponderosa pine (*Pinus ponderosa*) and bunch grasses on the dry sites to subalpine fir, white bark pine (*Pinus albicaulis*) and subalpine larch (*Larix lyalli*)in the overstory near

Table 11. Approximate areal extent of common habitat series on the Flathead Indian Reservation (pp. 11-12, Forest Management Plan).

Habitat series	Approximate areal extent (%)
Pseudotsuga menziesii (Psme)	61
Abies grandis (Abgr)	19
Abies lasiocarpa (Abla)	15
Pinus ponderosa (Pipo)	4
Thuja placata (Thpl)	1
	100

Table 12. Summary of forest habitat types on Flathead Indian Reservation.

Habitat Type Group	Forest Habitat Types	Extent in Forested Lands (%)	General Climate	Dominant Plant	Timber Productivity[1] (cu ft/ac/yr)
A	SCREE PIPO PSME/Agsp	5	Warm, very dry (usually very low elevations)	Ponderosa pine with understories of bunch grass	low 15
B	PSME/Syal PSME/Caru PSME/Phma	24	Dry	Ponderosa pine overstories-understories intermediate between groups A and D	Low to moderate 20
C	PSME/Vaca PSME/Phma PSME/Syal PSME/Caru PSME/Spbe PSME/Vagl	31	Moist	Ponderosa pine, western larch, and Douglas-fir with understories mostly of shrubs	Moderate to moderately high 20+
D	PSME/Libo Pien/Clun Abgr/Xete Abgr/Libo Abgr/Clun Thpl/Clun	25	Near optimum moisture and temperature	Wide variety of overstory species	High 45

[1] These values represent current yield. Volume yield is increasing significantly as stands come under management.

Table 12 (continued).

Habitat Type Group	Habitat Types	Extent in Forested Lands (%)	General Environment	Dominant Plant Growth Forms	Timber Productivity (cu ft/ac/yr)
E	Abla/Clun Abla/Libo Abla/Mefe Abla/Alsi Abla/Vaca Tsme/Mefe	13	Cool moist	Wide variety of overstory and understory species	High 40
F	Abla/Xete Abla/Luhi Abla/Vasc Abla/Libo Tsme/Xete	2	Cold and/or dry	Subalpine (mostly subalpine fir)	Moderate 20
G	Abla/Vasc Abla(Pial/Vasc Abla/Luhi Laly-Abla Pial-Abla Pial	1	Very cold (near timberline)	High elevation species	Low 20

Note: Some habitat types may occur in more than one group.

timberline. Timber productivity varies from less than 15 to 45 cu. ft./ac./yr., but more importantly, the potential exists for increasing the timber productivity of the better sites to over 100 cu. ft./ac./yr.

Habitat types are distributed in predictable patterns. Grand fir types occur throughout the forested lands of the reservation, subalpine fir types are mostly restricted to the east side, on the higher slopes of the Mission Mountains. Ponderosa pine types are mostly at the grassland-forest ecotone and western red cedar (*Thuja plicata*) occurs as narrow riparian areas throughout the Reservation.

Range. The range resource of the Reservation includes all forests (commercial and non-commercial) and grasslands capable of providing forage for grazing and browsing animals. This resource includes those lands that have been vegetated either naturally or artificially to provide a forage cover that is managed as native vegetation.

Approximately 335,000 acres have been identified as range for livestock and wildlife on the Reservation. About two-thirds of this acreage is categorized as commercial forests and are thus subject to multiple uses.

The forested ranges in western Montana can be classified as permanent or transitory forest ranges. The permanent forest range is characterized by an open overstory of ponderosa pine and/or Douglas-fir with an understory of bunchgrasses and shrubby species. This forest type produces a permanent forage supply which is used by livestock during the spring, summer and fall and by elk (*Cervus canadensis*), mule deer (*Odocoileus hemionus*), and white-tailed deer

(O. virginianus) as winter and early spring range. These areas are the warmer and drier sites and have low timber productivity. On the Reservation, the ponderosa pine types and the Douglas-fir bunchgrass types (Group A in Table 12) account for an estimated 5% of the forested lands.

Douglas-fir habitat types that are transitional between bunchgrass habitat types and those dominated by shrubs (Group B in Table 12) also supply much permanent forest range. These sites are low to moderate for timber productivity; wildfire incidence is high and has maintained a ponderosa pine forest cover. Habitat types in group B include Douglas-fir/common snowberry (Symphoricarpus albus) in both bluebunch wheatgrass (Agropyron Spicatum) and common snowberry phases, Douglas-fir pinegrass (Calamagrostis rubescens) in both bluebunch wheatgrass and ponderosa pine phases, and Douglas-fir/ninebark (Physocarpus malvaceus) in the pinegrass-dry phase. These areas are good for forage production and comprise 24% of the Reservation.

The transitory forest ranges occur in dense stands of Douglas-fir and western larch (Larix occidentalis), Engelmann spruce (Picea engelmanii), and subalpine fir or associated forest types. Most of the livestock grazing in this zone occurs on dry parks, meadows and riparian areas or on areas that have been logged or burned. Since almost all of the limited area of natural openings that are available to cattle will be heavily grazed with even light stocking rates, burning or logging present the only major opportunity to increase the grazing value of these forested areas. After being opened up through logging, these areas are available for use by cattle for a number of years until the forest regeneration closes over the areas.

On the Reservation, areas in forest habitat type groups C, D, and E (Table 12) could be important as transitory range. Group C includes Douglas-fir habitat types that are characterized by shrub understories. Productivity for timber is moderate to moderately high.

Some of these areas provide big game winter range and elk calving areas. Thirty-one percent of the forested lands are in group C, which are very marginal livestock grazing lands when canopy cover exceeds 50%.

Group D climax species includes grand fir, western red cedar and Engelmann spruce. Timber productivity is high and group D habitat is of lesser importance for big game winter range. These sites are usually of minor importance to livestock grazing but clearcuts in the spruce-fir zone are very productive, and may produce over 1200 lbs./acre of forage. Twenty-five percent of the Reservation is in group D.

Group E habitat types are subalpine fir and mountain hemlock (_Tsuga mertensiana_) climax types with high timber productivity. This group receives moderate fall and summer use by big game. Grazing by livestock is not important on these areas, but some grazing could occur on clearcuts. However, these areas comprise only 13% of the commercial forests and should not be considered as potential grazing sites because of wildlife values.

Fauna. The 1982-1991 Forest Management Plan contains an excellent description of the fauna on the reservation, along with habitat information for the various species. The reader is encouraged to read the wildlife section of the plan for information in addition to that presented below. Fauna do not play the central role in forest management decesions as does the flora (habitat types), and most attention is focused on the big game species common on the forested part of the reservation: white-tailed and mule deer, elk, black bear (*Ursus americanus*), grizzly bear (*Ursus horribilis*), moose (*Alces alces*), bighorn sheep (*Ovis canadensis*) and mountain goats (*Oreamnus americanus*). Grizzly bears, bighorn sheep and mountain goats are found mainly in the Mission Mountains; the others are widely distributed throughout the Reservation.

Numerous nongame species are found on the Reservation in a wide range of habitat conditions. A list of the species is too extensive to include in this report. There is a need to survey the nongame fauna and identify their habitat needs for the reservation.

Endangered and Threatened Species. The American Indian has close cultural ties to plants and animals. Thus, the decline or elimination of a species must be an important consideration in forest management plans. No plants are currently considered endangered in Montana, although some may eventually be listed, following a more careful review.

Six animal species are considered endangered or threatened in the general area that includes Montana, but only the endangered gray wolf (*Canis lupus*), endangered bald eagle (*Haliaeetus leucocephalus*), endangered peregrine falcon (*Falco peregrinus*) and threatened grizzly bear occur in the general area included in the Reservation. Gray wolf sightings are extremely rare in Montana; a positive identification has been made on the Reservation.

The bald eagle has been well studied in the United States and in Montana by Riley McClelland. Also, site specific information has been collected within the Reservation by biologists of the Bureau and the Tribe. Much is known of the bald eagle's life history, reproduction and habitat requirements. Approximately 400 winter in Montana, but the number wintering on the reservation is unknown. Bald eagle data were last collected in 1979-1980. Many migrate through the Reservation, although some are resident birds. The residents nest on islands in Flathead Lake and along the Flathead River, and they concentrate near food sources, especially carrion.

The peregrine falcon has not been intensely studied, especially in Montana (Herman and Willard, 1977). The peregrine falcon is a solitary bird. It nests in cliffs and feeds mostly on birds. Known and suspected nest sites are kept in records in the B.I.A. Office.

The grizzly bear is very well studied in Montana and well discussed in the Management Plan.

Ecology. Ecology is defined here as the "study of the interrelationships of plants, animals and man in the environment over time". In theory, all aspects of the assessment are a part of an ecological evaluation. The Ecological Interrelationships section in Part 2 of the Environmental Assessment describes the expected impacts of each preferred alternative on the overall interrelationships, synthesizing the results from individual factors such as soils, animals, etc.

While forest habitat type data do not relate well to soils, forest habitat typing is a useful method of vegetation classification and does show relationships to annual rainfall and topography. For purposes of this report, forest habitat types will be grouped by the same method used in the 1982-1991 Forest Management Plan. In this environmental assessment, habitat types will be referred to by groups as appropriate.

Since each aspect of ecology (soils, geology, wildlife, etc.) is being covered in detail, the discussion presented here represents only an overview of ecological impacts. Table 13 is a composite produced from the Flathead Indian Reservation Management Plan and the Habitat Typing Manual (Pfister et al. 1977).

Fish. The fisheries resource is very extensive across the reservation. the major waters containing important fisheries include Flathead Lake, Flathead River and the Jocko River. Rainbow Lake, Nine Pipe Refuge, Sain Marys Lake, and numerous reservoirs, creeks and lakes support major fisheries that are a valuable source of food and recreation to Indians and non-Indians alike. Common trout species found in the region are all present in reservation waters, along with salmon, lake trout, bass, northern pike, perch, and various other game and non-game species.

Indians on the reservation had close cultural ties to the fisheries resource. Thus, the decline or elimination of this resource must be an important consideration in forest management plans.

Table 13. List of habitat types by productive potential and precipitation.[1]

Production		Characteristics of Group								
Group - phase		Fire Group	Livestock and Wildlife	Timber Productivity (cu. ft/ac/yr)	Site Index 50-yr.	Max. Pot. Basal area	Climax Species	Climate	Soils	Annual Precip. (in.)
Group A										
% of area 5%	Scree[2] Pipo, Agsp Pipo, Feid-all Pipo, Putr-all Pipo/Syal-all Psme/Agsp Psme/Feid Psme/Fesc		Big game winter range forage for livestock	15	45	75-150	Psme Pipo	Warm, dry 12[1] 16 in/yr July temp. 66-72°F Jan. temp 20-26°F	Shallow rocky	15
Group B										
Uneven aged 24%	Dry Psme/Syal-Agsp-Syal	4	Big game winter range good forage	10 Slow Regeneration, 25 yrs.	50	No data	Psme	Warm sl. more moist than A High fire area July temp 61-66°F	Too dry for Pico, Laoc	14-17
	Psme/Caru-Agsp, Pipo	4								
	Psme/Phma-Caru	4								

[1] Compiled from BIA (1982) and Pfister et al. (1977).

[2] Variable Precipitation but low overall production

Table 13 (continued).

Production		Characteristics of Group								
	Group - phase	Fire Group	Livestock and Wildlife	Timber Productivity (cu. ft/ac/yr)	Site Index 50-yr.	Max. Pot. Basal area	Climax Species	Climate	Soils	Annual Precip. (in.)
Group C										
% of area 31% Uneven and even aged	Mesic Psme/Vaca Psme/Phma-Phma Psme/Syal-Caru Psme/Caru-Aruv, Caru Psme, Psbe Psme/Vagl-Vagl, Aruv, Xete	 6 6 6 6 4 6	Big game winter range, elk calving, areas Dwarf mistletoe problem Marginal for livestock	20+ (could reach 70) Slow regeneration and recovery Ground cover competition heavy	No data 60[1]	No data	Psme-shrubs	Cold, mesic some too cold for Pipo 18-19 in/yr[1] July temp. 60-66°F Jan. temp. 17-22°F	Variable	17-22
Group D										
25% Uneven and even aged	Mesic, Warm Psme/Libo-all Pien/Clun-all Abgr/Xete Abgr/Libo-all Abgr/Clun-all Thpl/Clun-all	 11 6 11 11	Minor big game value, and livestock use Variable understory vegetation	45 (to 115 w. intensive management) Good natural regeneration	No data 80[1] 100	No data	Abgr Thpl Pien Abla Seral are Laoc, Pico, Psme Pien	Moist warm to cool low wildfire frequency destructive when it occurs 23 to 35 in/yr[1] July temp. 64°F	No data	25

Table 13 (continued).

Production										
		Characteristics of Group								
Group - phase		Fire Group	Livestock and Wildlife	Timber Productivity (cu. ft/ac/yr)	Site Index 50-yr.	Max. Pot. Basal area	Climax Species	Climate	Soils	Annual Precip. (in.)
Group E										
% of area 13% Even-aged	Mesic, Cool Abla/Clun-all Abla/Libo-Xete Abla/Mefe Abla/Alsi Tsme/Mefe Abla/Xete-Vagl Abla/Vaca		No data fall and summer big game use	40 (to 110 w. good management)	No data 70^{3} 90	No data	Abla Tsme Seral spp. are Psme Laoc Pico, Pien	Moist, Cool 28 in/yr to 48 in/ yr^{1} July temp. 57-64°F Jan. temp. 15-20°F	Vari- able	25
Group F										
2% Even aged	Abla/Xete-Vasc Abla/Luhi-Mefe Abla/Vasc-Caru Tsme/Xete Abla/Libo-Libo and Vasc		Elk summer	20 (to 55 with intensive management	No data 30^{1} 62	No data	Abla Seral spp. are Pien, Pico, Pial	Sub- alpine too dry or cold for Psme Laoc-Heavy fuels, wildfire hazard July temp. 58°F	Vari- able	25

[3] Extrapolated from Pfister et al. (1977).

Table 13 (continued).

Production Group - phase		Characteristics of Group Fire Group	Livestock and Wildlife	Timber Productivity (cu. ft/ac/yr)	Site Index 50-yr.	Max. Pot. Basal area	Climax Species	Climate	Soils	Annual Precip. (in.)
Group G										
1% Variable	Abla/Vasc-Vasc Abla(pial)/Vasc Abla/Luhi-Vasc Laly-Abla Pial-Abla Pial		Watershed mainly and elk summer range, grizzly bear habitat	20 or less slow vegetative recovery after disturbance	No data 10-[1] 30	No data	Variable intensity open	Timberline, cold short growing season July temp. 49-53°F	Variable, shallow cold	25

Geology

The Flathead Reservation is underlain by basement rock of Beltian age, which constitutes over 20,000 feet of argillites, quartzites and carbonates more than 1 billion years old. Tertiary sediments fill the major valleys with shales and sandstones, ending abruptly against faulted mountain fronts of early Tertiary age. Surficial sediments of Pleistocene (glacial) and Recent age mantle the Tertiary formations and form river, lake and outwash deposits of sands and silts across the valley floors. Occasional young (Mazania age) volcanic ash deposits are inter-bedded with sands and silts of Pleistocene age.

Bedrock Geology. Belt age argillites, carbonates and quartzites constitute the bedrock geology of the Reservation, outcropping on mountain ridges and slopes, and underlying younger sediments in the valley bottoms at depths of a few thousand feet below the surface. These Belt rocks are slightly metamorphosed from their sedimentary rock state, are generally well-bedded, east-dipping, from generally thin soil mantles without much chemical weathering, and underlie the basic middle and high altitude ecosystems of the Reservation. East-facing mountain slopes are commonly dip-slopes, and therefore, are more unstable, though generally flatter, than west-facing mountain slopes.

Current drainage systems which cut Belt rocks on the Reservation are usually underloaded and downcutting in character. Soils developed upon Belt rocks are usually thin, change little in chemical character from the original rock minerology, and are easily eroded or disrupted from place of origin. The soil-based ecosystem (plants and animals) are therefore in a tenuous state of equilibrium over Belt bedrock, and special care and treatment is required in land use activity to maintain the ecosystem.

The Belt bedrock is also host for whatever valuable mineral resources may be found on the Reservation. The Reservation marks the southern limit of the stratiform copper mineralization characteristic of northwest Montana Beltian environments. Although economic resources have not been discovered on the Reservation in Belt rocks, future exploration could produce one or more finds.

The Flathead Mine lies near the Reservation and localizes precious metal mineralization along hot spring vents associated with Tertiary age volcanics that are inter-bedded with sedimentary rocks. Alteration and mineral halo effects may be present in a number of places on the Reservation; however, exploration has been limited outside of the Hog Heaven (Flathead Mine) area. Exploration and development drilling in the Hog Heaven area will determine the economic availability of ores in the near future; other Tertiary to Recent volcanic vent zones on the Reservation also need preliminary evaluation for their economic potential.

Unexposed Paleozoic sediments may lie at depth between slices of Precambrian Belt rock as a result of compressional (thrusting) tectonics that affected the area in late Mesozoic to Early Tertiary time. The Paleozoic sediments, if present at depth, may contain carbonate and/or sandstone horizons that could be oil-bearing. Current exploration in the Troy/Libby area of Montana will test the likelihood of this interpretation of recent seismic data in the Flathead Valley.

Valley Fill Deposits. Pronounced north-trending block faulting controlled major valley formation during the Tertiary and localized middle to late Tertiary shales and sandstones. Valley fill occurred concomittant with downward movement and rotation along the dominant valley fault. These normal faults apparently flatten with depth, limiting the thickness of the younger, Tertiary rocks in the valleys. The Tertiary sediments usually dip into the mountain-front near the valley sides. Volcanics are inter-bedded with the sediments but do not constitute a major part of the Tertiary lithology.

Tertiary valley fill forms outcrops on the lower slopes of the mountain blocks and in the valley proper. Soils are usually derived from weathering of sedimentary material and change little chemically, except perhaps for the volcanic component of the section. These soils can be thin to moderate in depth, fragile in structure, and easily erodable when disturbed without precaution for rapid stabilization. In places, the Tertiary is cut by stream channels, producing both downcutting and aggrading stream forms, depending upon bedrock and water availability. Riparian vegetation rooted in the Tertiary is moderately stable, provided that the ecosystem remains undisturbed.

Tertiary mineralization is mainly related to hot spring deposition of precious metals associated with volcanic rocks. Although the Hog Heaven district is the only currently identified potentially economic deposit, other areas of the Reservation may have commercially developable ore.

In the deeper valley sections, potential gas, and perhaps oil, might be discovered in the future. Gas showing in other Tertiary valley sections in southwest Montana in recent years has stirred exploration in the larger Tertiary valleys. The Flathead Valley is a likely candidate for future drilling.

Pleistocene and Recent Sediments. Glacial Lake Missoula sediments and associated glacial deposits dominate the youngest rock section on the Reservation. These deposits are mainly lake silts or delta sands and outwash associated with different lake levels during Pleistocene history. The longevity of the ice dorn that blocked Flathead River/ Clark Fork River flow together with ice-intensified erosion of the drainage basins provided large quantities of sediment to Lake Missoula. About 2500 feet of ice filled the Flathead Valley to the position of Polson, forming a push moraine at Polson and at Big Arm at the mouth of the Big Draw. A spillway from the melting ice cut a new channel of the Flathead River at Polson, floored in the Lake Missoula silts.

Where lake silts and glacial material compose the surface outcrop on the Reservation, the "soil" material is relatively stable, thick, and flat lying. Recent overbank deposits along the Flathead River and tributaries constitute the youngest sediment on the Reservation. With Flathead River regulation below Kerr Dam, flooding is unlikely or minimal and Pleistocene and Recent deposits constitute stable formations with respect to erosion, unless land use practices dramatically change the amount and character of the vegetative cover, or form and rough practices change drastically in the future. Where riparian vegetation is rooted in Pleistocene and younger formations, stable ecosystem conditions should abound, unless the riparian zone is disturbed or flood control measures fail. In small drainages, uncontrolled stream flow could change erosional regimes of the soft, unconsolidated Pleistocene and Recent material, if climatic or land use changes alter the amount and seasonal distribution of the precipitation and runoff.

Outside of the possible use of some Pleistocene and Recent sediment for clay, brick and other building material, there are few economic utilization possibilities in rocks of this age.

General Surface Hydrology Perspective

The environmental consequences of each Management Concern in the Plan were evaluated in terms of changes from undisturbed conditions. Management effects on water yield, timing, and water quality (primarily sediment) are discussed where appropriate.

The Reservation is topographically and climatically complex. The hydrology of the lower elevations is rain dominated. Much of the forest environment is arid to semi-arid. Evapotranspiration demands exceed precipitation inputs. Water yield increases (short-term and long-term) are not expected from forest management activities in general.

The highest elevations exhibit rain and snow-dominated hydrology. Precipitation generally exceeds evapotranspiration. Water yield increases following forest management activity will occur. The timing of the water yield increases is an important consideration, as is snowmelt desynchronization. Peak discharges may be increased or decreased as a result of desynchronization. Water yield increases typically appear as accelerated snow melt runoff because of reduced soil moisture recharge requirements, and as higher summer and low flows, because of the reduced evapotranspiration draft.

Suspended sediment is the principal water quality problem associated with forest management activity. Sediment is produced by channel erosion and by hillslope processes. Channels form to accomodate their predominant peak discharges (bankfull to mean annual flood), and the duration of those discharges. If, because of snowmelt desynchronization, annual peak discharges are reduced, increased water yields will not accelerate channel erosion and increase sediment loads.

Erosion will follow site disturbance on hillslopes. The question is if and when detached material (soil and plant) will be introduced to streams. The most important determining factors in sediment delivery are: 1) availability of water for surface runoff (precipitation minus infiltration), 2) ground cover remaining after disturbance, 3) slope gradient, and 4) delivery distance (distance of sediment source to a stream channel). Thus, sediment production following forest management activity is going to be very site specific.

The following generalizations were made for the Environmental Assessment:

Available water for runoff: Rainfall intensities in Montana's timber harvest zone don't exceed infiltration capacity unless fire has produced a temporary hydrophobic condition or soil compaction has been severe.

Ground cover remaining: This is generally a function of the intensity of disturbance. For example, high intensity fire or tractor activities disturb ground cover more than cable logging.

Slope: The steeper the slope, the greater the likelihood of sediment delivery, all other factors being constant.

Delivery distance: In general, as the size of the disturbed area increases, the distance to a stream channel is likely to be less.

Soils

Soil Perspective. Soil is defined here as the mineral and organic mantle of the earth's surface in which trees and associated vegetation grow, including roots, rocks, microorganisms, nutrients, organic molecules, gases, animals, and water. The soils to be discussed are only forest soils, or soils capable of supporting trees.

Data will be provided where available. New data developed in the last ten years from research will be referred to as appropriate.

This evaluation considers that the prime concern of a land manager in making long-term decisions on the use of forest land is the native capabilities of the soil itself as a primary resource. The question basic to evaluation is: "What can this soil do best in the existing climate to provide long-term benefits?" The answer to that question can lead to long-term forest productivity.

Soil profile descriptions, chemical and physical data, vegetation descriptions, slope, aspect, habitat types and capability ratings are available for the Flathead Indian Reservation for Lake County through the Soil Conservation Service (1983) and data from differing areas such as the Flathead National Forest (1982). The soil survey for the Flathead Natonal Forest (USFS, 1982) is included because many of these soils also occur on the Flathead Indian Reservation. Supplementary information was taken from the Soil Survey of the Nine Mile/St. Regis Area (Soil Conservation Service 1972) and the Soil Survey of the Lower Blackfoot Area, (Soil Conservation Service 1973). The latter two surveys contain material of value because the areas have some of the same soil series. The Soil Conservation Service survey data are difficult to relate to the US Forest Service survey data. The former uses soil series names while the latter uses soil families and subfamilies (Seventh Approximation 1975). Both systems include use limitations or capability classes and some physical and chemical data.

The 1974 Environmental Impact Statement for the Flathead Indian Reservation (Cummins 1974) contains extensive listings and tables covering soil capabilities, land forms, taxonomic units, definitions of terms, capability-sensitivity ratings, impact anaysis, road management, habitat types and timber types, impacts on natural forests, compaction and a summary impact statement. The impacts of various treatments are summarized by drainage and soil capability and sensitivity classes. This report largely uses series names and is compatible with the earlier report. Few chemical data are included for soils in the 1974 Environmental Assessment. However, the physical data in the 1974 report are still pertinent and useful and provide a valuable reference source for the present report. The authors see no need to duplicate the soils data from the Cummins (1974) Report in the present report, but will use the former for cross-checking and reference.

Considerable research on soil chemistry, erosion, compaction, fire and logging has been done in western Montana since 1974. This new information will be used wherever it is appropriate in assessing the impacts of land use. Summaries of the major soil series in Lake County and adjacent areas that have particular physical or chemical limitations are included in Appendix B and will be referred to during the assessment by group numbers (1=high sand, 2=silty, etc.). A similar grouping of soils for the Flathead National Forest is included in

Appendix C, but series names are not available for these soils. Some data available for the soil classification system (Flathead National Forest) are not available for the series descriptions for Lake County. Appendix C will be used in the assessment process in the same manner as Appendix B. A cross-referencing system between the two tables relating soil series to the subgroup in the new classification system is presented in Appendix D. Some changes in soil taxonomy have occurred in the past ten years relative to the 7th Approximation so that all soil series may not be classified by the new system in the same manner that they were listed by Cummins (1974).

The groupings in Appendices B and C are derived from soil survey records of varying ages. Some contain more physical and chemical data than others so that some soils may not yet appear in groupings where they would be included if more information were available. It is hoped that over time these groupings will be completed as new information is developed. Soil series marked with an asterisk have been included in a particular group based on data for the soil series or subgroup from outside of the Lake County Survey (SCS 1982). The conditions of a soil outside of the mapped area may not coincide completely with those for the same series within the unit. The reader is referred to SCS, Soil Taxonomy (1975) for definitions of soil terms used and to the Literature Cited section for pertinent references. These supplement those in Cummins (1974).

Since habitat types have not shown close correlations with soil series, habitat type will not be used extensively in this assessment for soils. Habitat types more nearly represent vegetation types, but a treatment that is pertinent for a vegetation type may not suit the capabilities of a soil. The extent of each soil series is described by Cummins (1974) in Chapter 7. The reader is directed to existing soil surveys for profile descriptions and details of classification. For portions of the Flathead Indian Reservatin outside of Lake County or the Flathead National Forest where soil surveys and soils maps do not exist, the manager will have to classify the soil and match the descriptions to those from the existing survey profile descriptions before beginning to use this assessment.

There is little point in reevaluating the data from the older soil surveys because of differences in nomenclature. Note that limitations ascribed to one soil series in 1974 may not match exactly those reported in 1983 because of change in the name or definition of the type soil, or because of new physical and chemical data.

Discussion of Soil Groups. The criteria for establishing these groups were taken from SCS standard terminology and information added by N. Stark and B. Dutton. Soil hydrogen activity and ion availability data are from unpublished research by Stark.

Group 1 - Sand - 78.5% (some 60% to greater than 85%)

Forest soils with sandy textures occur on the reservation mainly along streams as recent alluvial deposits. They also occur on higher stream terraces as glacial outwash. A few sandy lake shores and windblown deposits occur in the Mission Valley.

Group 2 - Silt greater than 80% (some 50% to 80%)

The only deep, silty forested soils on the Reservation without large amounts of rocks are glacial lake deposits in the Mission

Valley. A few alluvial deposits and glacial tills have deep silts but cover small areas among other materials. In general, the limestone - and siltstone - derived soils have more silt than the quartzite or argillite soils. Andics with silty surfaces are common at higher elevations. On flat land, the andics may be rock-free but tend to be rocky on steep slopes (20-40%). Below 4,200 feet elevation, many soils have silty lacustrine surfaces from glacial Lake Missoula.

Group 3 - Clays greater than 40% (some 35% to greater than 40%)

Tertiary clays near Evaro support forests. These may be rock-free with up to 90% clay of the montmorillonite type. Surface pH may be 6 to 7 with subsoil pH of 4.5 to 6.0.

Groups 4 and 5 - Gravelly and Rocky Soils greater than 30% Rock or Gravel

These two types are combined at present, but it may be desirable to separate out soils with surface boulders from those with gravels within the profile at a later date. Colluvial and residual soils have 10-40% surface rock (to a depth of 10 inches) and 10-80% surface rock in the 10-60 inch zone. These are the most common soils on the Reservation. High elevation glacial till soils have rock contents similar to colluvial soils, while Mission Valley glacial tills usually have 0-20% surface rock and 25-50% subsoil rock.

Group 6 - Thin Soils (less than 20 inches depth)

Thin soils (less than 20 inches depth) occur in all colluvial and glaciated landscapes near rock outcrops on ridges and on canyon walls or cirque basins. Silty soils compacted by glacial ice may also be "thin" in the sense that roots cannot penetrate below 20 inches. Lithic soils have less than 20 inches depth to bedrock.

Group 7 - Slow permeability (less than 0.2 inches/hr)

Slow and very slow permeability is common on clayey tertiary soils near Evaro. Some clayey and silty lacustrine soils have slow permeabilities.

Group 8 - High Permeability (greater than 6 inches/hr)

Rapid permeability in high rainfall areas poses little problem for timber production. However, rapid permeability on soils with a low water holding capacity in more arid zones (less than 25 inches/year) of the Reservation is a problem for growth and regeneration. Rapid permeability is common on sandy and rocky glacial outwash soils.

Groups 9 and 10 - Wet Soils and High Water Table (less than 3 feet to water table or above field capacity most of the year)

Soils with high water tables are common along streams and lakes. They also occur in potholes and depressions in glacial till and outwash. Small areas with "perched" water tables occur in clayey Tertiary soils and on compacted glacial tills. Wet soils support trees only if the water table remains below two feet of the surface for most of the year. These soils are often of such limited area that they are not mapped separately. Organic soils have high water tables and few if any trees.

Group 11 - Steep Phases (greater than 35% to 40% slope)

Most of the colluvial soils are mapped in classes up to 60%. Some glacial units in cirques and along valley walls are mapped in classes up to 90%.

Group 12 - Windthrow Hazard (greater than 15 windthrow mounds/acre of any one age)

Windthrow is mostly a hazard where root penetration is impeded by a high water table, shallow bedrock, loamy surface soil, a compacted till, and where over-stocking limits root development., High wind environments and soils likely to have abundant water are subject to frequent windthrow. It is rare to find any soil that does not have a long record of windthrow of various ages. This is usually overlooked in mapping, so almost no information is available.

Group 13 - Erosion Hazard

Erosion is greatest on steep slopes with less dense soils, although even compacted soils may erode under high water pressure. Valley sandy outwash soils are erosive where they are steepened by streams (terrace edges and escarpments). Erosion potential is serious in the Reservation because of the steep soils. Stark and Biggam (1979) showed that soils with greater than 14% silt and less than 13% clay were most erosive.

Group 14 - Compaction Potential

Compaction hazard rating is a subject that has been strongly debated for the last decade in Montana. The most susceptible soils appear to be those with rock-free layers of silt loam or very fine sandy loam. The Tertiary soils, certain outwash and till soils and most lacustrine soils occur on gentle topography where equipment can operate and have few surface rocks to interfere with compaction.

Group 15 - Frost Heaving

Frost heaving is a hazard to seedling establishment on all loamy soils with abundant free water in the fall months. Litter cover reduces the frost heaving problem. Frost heaving helps to maintain a loose surface soil which can be damaged by heavy equipment after freezing. Frost heaving is thought to be a major factor in the slow re-opening of soil pores after compaction. Although compaction reduces the rate of movement of free water, some movement toward the surface occurs, allowing some frost heaving. Seedlings on bare soils can be completely uprooted by frost heave ice. Seedling mortality rating systems commonly in use are not based on frost heave potential.

Group 16 - Potential Low Water Holding Capacity (less than 5 inches of water storage in the feeder root zone)

Outwash, shallow soils and colluvial soils or young residual soils typically have low water holding capacities. The problem is most severe for trees in the drier zones (less than 25 inches/year).

Group 17 - Equipment Limitations (See SCS Guidelines)

Soils that are steep, fine-textured, stony or bouldery on the surface, wet, shallow, droughty or with calcareous layers pose the most problem for equipment. The SCS has a specific rating system for equipment that is too lengthy to include here.

Group 18 - Roads

Roads must be built on stable slopes of gentle grade with compactable soils that will not rut or slump.

Group 19 - Cold Soils

Frigid soils are on lower slopes up to 5,000 feet elevation on north aspects and 6,000 feet elevation on south aspects. Cryic soils pose problems of water and nutrient availability, mineralization rates and (sometimes) seedling establishment. These are grouped under cold soils to 7,000 feet elevation on north aspects and 7,500 feet elevation on south aspects. Cold phases of cryic soils are mapped above 7,500 feet on south aspects and above 7,000 feet elevation on north aspects. Mainly cold phases of cryic soils and cryic soils are included in group 19.

Group 20 - Calcareous Topsoil (greater than 4,000 ugCA/g soil)

There are small areas of calcareous topsoils on the reservation forests on limestone colluvium. A few small areas occur where erosion has bared limestone subsoils that have calcium levels (greater than 4,000 ug/g) in the subsoil. This level of calcium is not prohibitive of conifer growth, but may grow calcareous ecotypes of various conifer species. Local seed sources are likely to be the most successful, and occasional problems with seedling establishment can be expected.

Group 22 - pH High for Conifers (greater than 8.3 or 8.1)

Soils with a pH over 8.3 have low levels of available phosphorus and trace elements and may restrict conifer growth severely and interfere with seedling establishment. Alkaline pH is less of a problem to tree growth in high precipitation zones (greater than 25 inches/year). Some species such as lodgepole pine (Pinus contorta) are more sensitive to soil pH than is Douglas-fir.

Group 23 - Acid pH (less than 5.5)

Soils with a pH less than 5.5 are likely to be well-supplied with trace metals needed for growth, but calcium, phosphorus and other ions may be poorly balanced or deficient. Mineralization is likely to be slow, as is nitrogen fixation. Wet, organic muck or peat soils, Tertiary subsoils, and very high elevation quartzite and argillite soils are often quite acidic (less than 5.5).

Group 24 - Low Cation Exchange Capacity (less than 5 meq/100 g soil, Stark)

Soils with under 5 meq/100g of cation exchange capacity are thought to be low in Cation Exchange Capacity (CEC) for trees. Shallow soils, sandy soils and most subsoils of colluvial and residual soils typically have low CEC.

Group 25 - Low Nutrients (Hypo-chemically fragile soils)

Almost no data exist on the trace metal content of reservation soils. Recent research by Stark (U of Montana) suggests that widespread low-level trace metal deficiencies may be common in western Montana. Group 25 was created to accommodate new information that will be developed in the next ten years. "Suspect" levels of nutrient deficiencies are currently being tested in the laboratory by N. Stark. Nitrogen deficiencies are thought to occur widely in Montana, particularly in the drier and colder soils, and those of high acidity or alkalinity.

Group 26 - High Nutrients (other than Ca) (Hyper-chemically Fragile Soils, Stark)

These are soils derived from parent material that produce an imbalance of biologically essential ions or arid soils where ions are not properly leached. Calcareous soils are one type of HYP soils that do occur in the reservation's forests. Some sodic soils also occur but do not grow trees. It is hoped that more information will be added to this soil group in the next ten years.

The groupings of soils from the Flathead National Forest (Appendix C) are somewhat artificial, since each soil is placed in a group on the basis of chemical data from one to four samples. Natural soils vary considerably in chemical and physical properties within short distances (Brady 1974). Thus, the soils may be placed in some groups in error if the one to four samples analyzed are not representative of the entire soil unit. Most soil units cover many square miles so that natural variability over time and space is considerable. The soils placed in each group are considered to be indicative of a tendency for that particular characteristic, but soils in the field may vary on both sides of the conditions described for the group. The user is encouraged to examine a soil in the field to determine if it conforms to the standard set for that particular soils subgroup or series.

The Soil Conservation Service (SCS) mapped most of the reservation before 1972. Since then, the SCS has mapped the area north of the Flathead River and west of Flathead Lake. There will be two years of mapping unit verification: the report will be published at least three years later. Thus, the final report will probably not be available in published form until 1990.

Currently, the BIA and SCS in Polson have the draft soils survey for the Lake County area. The SCS is refining and updating the draft survey report.

Soil Types and Distribution. The 1974 Environmental Impact Assessment presents the distribution of the major bedrocks in the reservation. These data and estimates of Boast indicate the following soil parent materials are common:

Parent Material	Extent (%)
Belt - bedrock (quartzites, argillites some limestones	60
Glacial till from Belt rocks	15
Alluvial	10
Valley bottoms	2
Other	13
	100

In addition, about 40 percent of the forested area of the reservation has a mantle of volcanic ash.

The 1974 EIA also shows the extent of various soil taxa in the forested part of the reservation:

Soil Taxa	Extent of Reservation (%)
Typic and Audic Ustochreps and Audic Cryochrepts	34
Typic, Udic and Lithic Usthochrepts and a few Eutroboralfs	18
Eutroboralfs	8
Borolls	2

These data show that the most common soils in the forest zone have very little development: about two-thirds of the reservation or 86 percent of the forested part of the reservation has Inceptisols. These are soils without alluvial clay horizons, and they probably are rather stony and not very deep.

The Andic subgroups merit special attention. These are soils with mantles 7-15 inches thick composed of brown, fluffy volcanic ash. The ash was blown into western Montana following some major eruptions in the Cascades. The ash imparts extremely favorable physical properties to the older soil: very low density, high porosity, high infiltration rates and high permeability. Ash is less common on dry sites; it is not found on ponderosa pine or Douglas-fir/bunchgrass types. It is usually on sites above 4,200 feet in elevation and is thicker (10-12 inches) in the east side (Missions) than in the west side (5-8 inches).

Generalized Soil Map. A generalized soil map for the forested part of the Flathead Reservation is shown in Figure 4. Descriptions of the map units follow.

UNIT R. Unit R (rockland) occurs in the Mission Mountains above the alpine-forest ecotone. A few scattered trees may occur. Slopes are very steep and the unit includes talus and colluvium as well as bare rock. The main inclusion is on gentle slopes where there is a mantle of volcanic ash.

UNIT A. Unit A includes soils with very limited development (Ustochrepts and Eutrochrepts). They are usually formed in bedrock and are very stony (skeletal), shallow, and loamy without evidence of clay translocation. Soil temperature regimes are frigid (cool) and moisture regimes ustic (seasonally dry) or udic (usually moist). Slopes are usually 0-30 percent.

Forest habitat types on these soils are Douglas-fir/bunchgrasses and Douglas-fir/shrubs (especially ninebark and common snowberry).

Inclusions in the map unit are Haploborolls near the forest-grassland ecotone. These are soils with dark (organic-rich) surface horizons. At high elevations and on north slopes, this unit may contain soils with a mantle of volcanic ash. Throughout the area, especially on gentler slopes, the map unit contains finer (more clay) soils in which clay has moved to subsoil horizons.

UNIT B. The major soil in Unit B has a 6-10 inch mantle of volcanic ash over very stony (skeletal), shallow and loamy soil. There is little or no evidence of translocated clay. Soil temperature regimes are cryic (very cold) as these soils occur only at high elevations (generally above 5,000 feet). Slopes are quite steep (30-60 percent). They occur only in the south and east sides of the Reservation.

Habitat types associated with this soil are of the subalpine fir and grand fir series and types of the Douglas-fir series common to wetter sites (for instance Douglas-fir/twinflower).

Inclusions in Map Unit B are rockland on very high and very steep slopes and Unit A soils on some south aspects just above 5,000 feet.

UNIT D. The major soils in Unit D have dark surfaces but otherwise little development. They are usually formed in glacial till and are stony (skeletal), loamy and deeper than those of Unit A. Soil temperature regimes are cool (frigid) and moisture regimes ustic (seasonally dry). Slopes are usually steep (30-60 percent).

Habitat types associated with these soils are Douglas-fir/ bunchgrasses, and Douglas-fir/shrubs (especially ninebark and common snowberry).

Inclusions in the map unit are Unit A soils on wetter sites.

GENERALIZED SOIL MAP OF THE FLATHEAD INDIAN RESERVATION

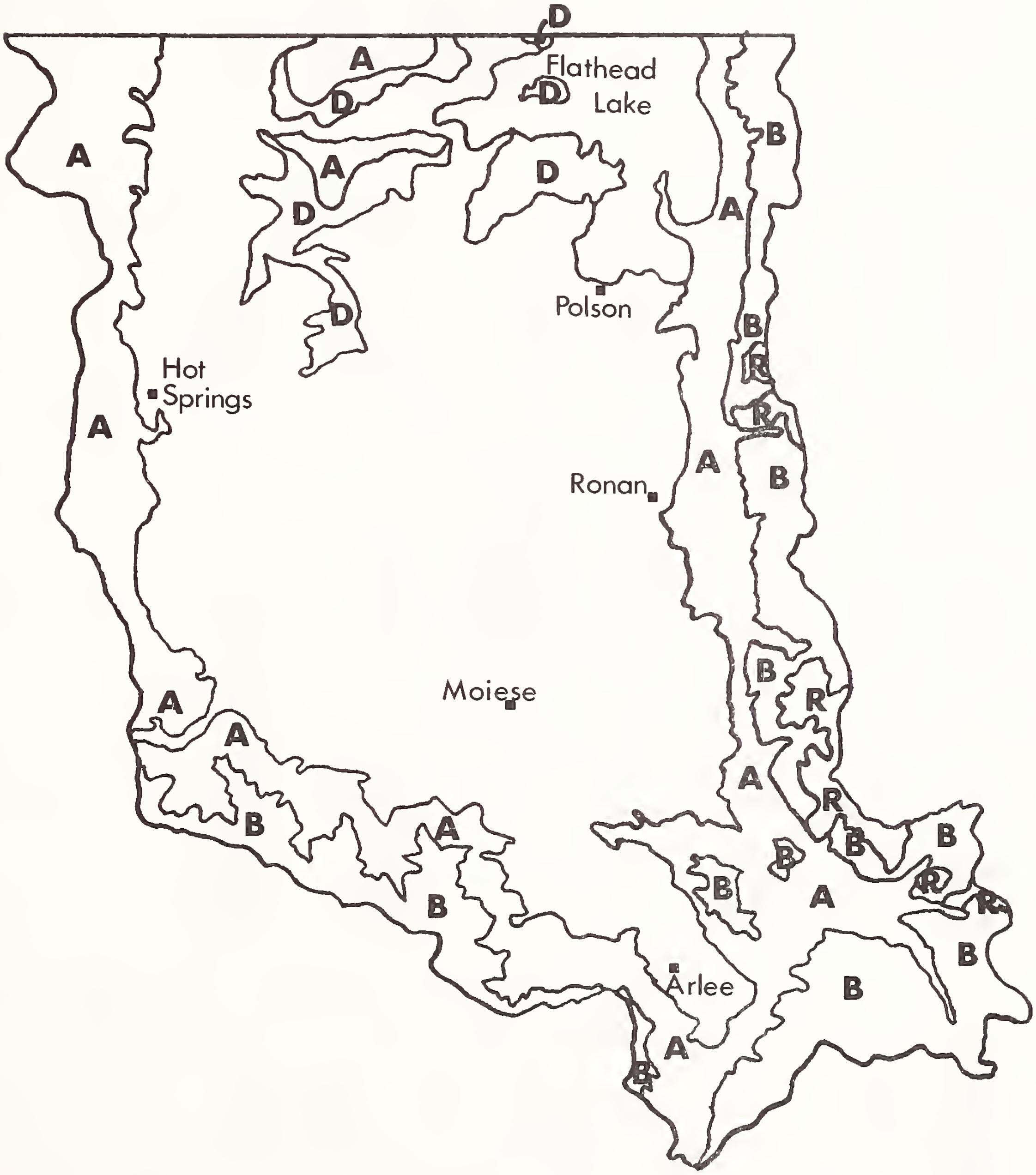


Figure 4.

Table 14. Generalized soil map key for forested part of Flathead Indian Reservation.

SYMBOL	SOIL UNIT	SLOPE GRADIENT (PERCENT)	MAJOR PROPERTIES	MAJOR INCLUSIONS IN MAP UNIT	SIGNIFICANT PROPERTIES OF INCLUSION	LOCATION OF INCLUSIONS IN MAP UNIT
R	Rockland	65-75	Unweathered rock (not	Andic Cryochrepts	Ash mantle, cold	Gentler slopes
A	Ustochrepts-Eutrochrepts		Weakly developed soils	Haploborolls	Dark surfaces	Just above grassland - forest eco tone
				Andic Cryochrepts	Cold, ash mantled	High elevations and north aspects
		0-30		Eutroboralfs & Argiborolls (clayey)	Higher clay contents	Throughout the unit but especially on gentle slopes east of Ronan
B	Andic Cryochrepts		Ash mantle, cold, weakly	Rockland	Bare rock or talus	Very high & very steep slopes
		30-60		Unit A	Drier, warmer	South aspects
D	Ustrochrepts-Haploborolls	30-60	Darker surfaces than Unit	Unit A	Lighter surfaces	Wetter sites

ARCHAEOLOGICAL AND CULTURAL SETTING

Introduction

There are several Federal laws designed to record, protect and to preserve archaeological and historical sites on Federal Lands, and on Indian Lands. A list of these laws, with briefs about them, is included in Appendix E. The management of reservation lands and forests must consider these laws as important when planning timber harvests, planting, or other Federal undertakings connected with forests.

A survey of archaeological and historical sites on the Confederated Salish and Kootenai Reservation was prepared in 1973, and it provided a good sampling of their numbers, types, and density throughout the reservation. Eighty-four sites, so far, have been located, but a more intensive survey on the reservation would undoubtedly yield many more. There is no question that many of these would be discovered in the timbered portions of the reservation. Mitigation efforts would be taken to comply with legal regulatory requirements.

Some Geographic Considerations: The intent here is to merely relate, in a general way, a few of the geographical features or characteristics of the reservation lands which have had an effect on human lives in the past as well as at the present time. These features are related to river drainage systems, particularly the following: (1) Flathead Lake, (2) the Flathead River and two of its major tributaries, the Little Bitterroot River and the Jocko River, and (3) the mountains which nearly surround the reservation, and the lesser ranges within the reserve.

Most of the human occupation during prehistoric times as well as at the present time is primarily in lower elevations, or the valleys. Seasonal activities, however, have required that the inhabitants move into the mountainous areas as well, particularly in seasonal quests for plant foods and for game. The mountains also had to be crossed, sometimes even during the wintertime, in maintaining communications or when travelling on war, hunting, or trade expeditions. Thus, trails can be considered to be of prehistoric and historic interest, too. Moreover, some mountain areas have some religious significance, a matter which is discussed more thoroughly elsewhere in this report.

It is in the mountains where most of the timber resources are found, although there is some timber around the shoreline of Flathead Lake, and in some places along the river courses. Usually, the valleys lack large stands of timber, and they may support grasslands, some brush, deciduous trees, and junipers.

The crests of the mountains reach 6,000-10,000 feet high, and they form natural boundaries of the reservation on the west, east, and south sides. The northern boundary line is one which is arbitrary, or artificial. There is a smaller set of mountains and high hills which besects the Reservation north and south along its middle. The Little Bitterroot River valley is located to the west of these smaller mountains while the Flathead River and Mission Valley are on the east. A deep narrow valley lies on the south, and through it flows the lower portion of the Jocko River and the lower Flathead River.

Cultural Management of Federal and Indian Lands and the Laws

Procedures for managing cultural resources and historic sites on Federal lands have existed since at least the period immediately following World War II. Since that time, additional legislation has become more specific, and the processes have been broadened to include all Federal agencies, even specifying Indian lands.

When a portion of a forest is scheduled for harvesting, or for some other operation (planting, etc.), local officials should contact the "State Preservation Officer," in the Montana State Historical Office, Helena, Montana, requesting a "file search" for any records of sites which may already be known in these localities. This information may be very helpful in ascertaining the density of sites, the types of sites present, their nature, and especially their locations. This information may help local officials decide about the need to make further studies of the area before operations commence or during the operations. The State Preservation officer may also have some recommendations regarding cultural management matters. Otherwise, the State of Montana has little involvement in the cultural management process. Most Federal agencies furnish information about newly discovered sites on their properties to the State Preservation officer for purposes of providing a common record for the entire state. If desired, the agency can request that the data be kept confidential, a practice which the U. S. Forest Service desires on lands they control. (This is to keep local collectors from over-running lands looking for "arrowheads" and destroying sites in their search for collections.)

If existing information indicates the possibility of cultural sites being present, then a decision must be made about whether to conduct a survey or not. There are penalties to be considered if laws are not followed. Other considerations include: Are the sites significant? If so, in what terms are they of cultural or historical significance? Should any of these sites be saved from destruction? (In the future it may be desired to restore some sites since they may have historic, cultural, or religious importance.)

Decisions concerning whether to save or destroy sites would involve an input from a number of other individuals or groups in addition to those directly involved in forest management. For example, tribal councils, cultural committees, and history groups would be concerned with sites.

If a site is declared not to be of major significance, then it might be destroyed. First, however, information about it must be recorded. It may be necessary on other occasions to maintain a "watch" at the site while it is being destroyed. This is in case hidden details and features come to light while machines, people, or other operations should uncover specimens, structures, and signs of human activity not observed from the ground surface.

The Federal Register, Vol. 44, No. 21, Tuesday, January 30, 1979, (Title 36 Parks, Forests and Public Property) Chapter VIII presents information on duties and obligations of Federal agencies, and their relationships with the State Preservation officer.

Types of Sites

People have occupied lands within the boundaries of the Reservation for at least 5,000 years, and probably much longer. The following list presents the names of types of sites which have been found on the Reservation, or may be anticipated to be discovered in the future. The list is followed by descriptions and details of these sites and their general characteristics.

Knowledge of the characteristics of prehistoric and historic sites is vital in considering cultural resources since they have to be recognized in the field before they can be recorded, salvaged, or saved for posterity. Decisions on these matters will be continuous as new finds are made, or as efforts are made to implement studies in the future.

There are at least 19 types of sites which have been recognized so far on the reservation. These are:

1. Occupation site (prehistoric)
2. Camp sites (located through informant or historic data)
3. Rock shelters or caves
4. Dwellings, impressions of pit lodges, cabins
5. Tipi rings
6. Root roasting pits
7. Sweat house remains
8. Pictograph panels
9. Vision quest sites
10. Stone piles
11. Stone quarries
12. Burials
13. Battle pits
14. Debarked trees
15. Dance grounds
16. Hot springs
17. Eagle-catching or wolf-catching pits
18. Historical sites
19. Trails

Occupation sites. Of the 84 archaeological sites which have been discovered and recorded so far, over 60% of them are ancient occupation areas or grounds. Debris found on such sites usually consists of stone tools or projectile points, grinding implements such as pestles and mauls, fire broken rocks or fire hearths, and stone chips and flakes discarded when tools were made by original technicians. These give clues to the nature of human activities at the sites. Sometimes, animal bones which were broken while they were fresh or "green" are found around the fire hearths.

Occupation sites are most frequently found in the valleys on the reservation. Their density is greatest around Flathead Lake, and along the banks of the Flathead River and its major tributaries. Fewer numbers have been found in the mountainous areas of the Reservation, perhaps because less work has been devoted to research in the more rugged lands such as in canyons and mountainsides. Often, too, sites have been obscured in the forests by dense understory vegetation. In the forests one might anticipate finding occupation sites wherever there is a place that might now be considered as a good campsite. The ancient people selected campgrounds for nearly the same reasons that campers seek a campsite today--fuel, water, relatively flat lands, protection from winds, and materials for making a camp more comfortable.

Most known occupation sites on the reservation are in valleys and open areas beyond forest boundaries. These are not directly affected by forest management activites; however, they may be indirectly affected through construction of roads or related industries such as log yards or mills. In the forests, as elsewhere, a preliminary search for sites should always be made before dozers and other construction or harvesting equipment are taken into the area.

Campsites. This term is used to distinguish or identify sites which are known through historic records, or through information obtained from "old timers", whether they are Native Americans or non-Indians. It may also coincide with an occupation site, a designation used here for a prehistoric camp or village where the knowledge of its existence was obtained through archaeology. At other times, such locations may only be discovered through documentary sources or from informants.

Rock Shelters and Caves. Due to the nature of the rock formations in western Montana, rock shelters and caves are very scarce. Only one site of this type, so far, has been reported on the Reservation (24 LA 1007). It is located along the shoreline of Flathead Lake on private property. Others, however, may be found during future investigations.

Dwelling Depressions or Pit Lodges. Ancient pit lodge depressions are found along the Columbia River and many of its tributaries. Since the Indians of western Montana have many close cultural ties with tribes farther west, it is expected that they would be found in western Montana as well. However, none have been reported so far. The listing of this type of site is for the purpose of alerting archaeological investigators and historians to the possibility of some being found in this area.

Tipi Rings. Tipi rings are circles of stones or small boulders. The diameter ranges from 12-20 feet. In ancient times, they held down the covering of conical shaped lodges, such as tipis. Tipis are usually regarded as having skin covers, often made of buffalo or elk hides, but coverings could have been made of other materials as well, including masses of poles, bark sheets, or grass mats. Tipi rings are scarce on the reservation, but researchers should be alert to the likelihood of their presence wherever a good camp location may be practical. Only three tipi ring sites have been reported within the present limits of the reservation boundaries, but more could be observed in the future.

Root Roasting Pits. Root roasting pits are fairly common on the reservation, and are quite distinctive. They are various sizes in diameter and depth. Much of the pit's size and form (whether deep or wide) is related to how much food was cooked, and how many layers of food were placed in the pit. Such pits have been used for over 4,000 years in Montana, and sometimes they are still employed in native cookery, so their uses are no mystery. Usually, a pit was dug into the ground. It was heated with a fire, and with very hot stones placed in the bottom. Moist vegetation was placed on top of the stones to provide moisture and heat for the plant foods being cooked. If several plants were being cooked, then they were placed in the pit in layers, each separated by more moisture providing plants.

Camas (Camassia quamash) roasting pits were generally dug at the edge of camas fields, where forests bordered on the field, and where fuel could be obtained for the fire. After the fire was ignited, it was covered with earth and allowed to burn for at least 24 hours. Bushels of camas, bitterroot (Lewisia rediviva) and other plant foods could be prepared for consumption or storage with this process. The fire hearths can be identified by the masses of fire-cracked stones, or burned stones, sometimes heaped aside the pit (since the pit might be used again).

Sweat Lodge Remains. The remains of sweat lodges, or even contemporary lodges, may be observed near a water supply such as a stream or lakeshore. An occupation site or campsite may be located nearby. Such remains may consist of a small pile of fire-burned or cracked rocks which had once been placed inside the sweat lodge. Sometimes, such as along Revais Creek (Site 24 SA 1024), sticks which once formed the shape of the lodge may still be present. In forested areas, some have been observed at the mouths of canyons; thus, they would be at the edges of forests and endangered by tree harvest or road construction into the canyons.

Pictograph Panels. Pictograph panels consist of drawings painted in red on rock cliffs, or on the walls of caves. Over 45 such sites are known for Montana west of the Continental Divide, and six sites have been recorded on the Reservation. Others may be found.

Such panels are not just of tourism value, but have historic, sentimental, and even religious value to many Indians on the reservation. These consist of some of their most spectacular ties with the past, and may be appreciated more and more by younger generations.

Pictograph panels are sites where young men anciently (and until just a few years ago) made their vision quest - a quest which would provide them with spiritual help. The drawings are sort of "signatures" of the persons who sought these powers. Thus, a panel may have been initially used a thousand years ago, and continued in use through the years to the present, or almost to the present. Spiritual helpers were sometimes obtained, or sought elsewhere such as on hilltops.

Occasionally, pictographs were painted on trees. Foresters should be alert to this possibility.

Vision Quest Sites. Their usage is very similar to that of pictograph sites. They are places where young men sought spiritual help in their quest for a more successful life. Most often, vision quest sites are atop hills or lower mountain tops. Small rock walls, circular in form and approximately three feet high, characterize these sites. Since eagle-catching pits were generally in high places, it may be difficult to distinguish between a quest site and an eagle-catching site. Sometimes the structures served both purposes. Eagle-catching pits, however, were more apt to be in sways between hilltops, and on fairly flat places.

Since vision quest sites are in the mountains and on hills, they are vulnerable to timber growth and harvest activities. Since they are apt to be along crests and relatively flat places where logging roads and equipment are apt to be located, the area should be searched by investigators in an effort to find them before such operations begin. Vision quest sites, for example, have been reported on low mountain tops in the forefront of the Mission Range, just east of St.

Ignatius, Montana. Hill tops and mountain tops were also used for vision quests without the construction of any sort of shelter. In these cases, there may be no signs whatsoever that anyone was ever there.

Stone Piles. Stone piles on the reservation originated mostly from two activites: offerings to guardian spirits by Indians travelling along trails, and modern survey markings. It is very unlikely that human burials in this area would include rock piles on the surface of the tomb. (This is a White Man trait.)

Most commonly, the existence of rock piles, especially along trails, is mostly an offering to guardian spirits. Typically, throughout North America, if not the entire world, a traveller during the past would toss a rock on such a heap as he passed by as a sort of acknowledgement to his guardian spirit or helper. Occasionally, relics such as an arrowhead or a bead were placed in the pile. As the years passed by, the piles increased in size, and sometimes they appeared in a lineup along the trail. Most often, stone piles are present in mountain passes or on passes between river drainages. Thus, they are apt to be in forested areas. Sometimes, such offerings were made at the base or in the branches of a tree along the trail. Thus, foresters should be aware of these ancient sites, and be able to recognize them.

Stone Quarries. These are scarce on the reservation and none are known to be present in forest lands. The same is true for pipestone quarries, one of which is known to be located near Flathead Lake, between Bigarm and Elmo. It is not on forested lands.

Burials. During the past, it was the custom to bury the dead near the camps where the person or persons had died. Since the ancients were mobile hunters and gatherers, there were no established graveyards as we know them today, nor were there markers left on or above the surface of the ground where burial took place. Hence, their discovery is almost always accidental. Usually, road building, erosion, or farm and ranch operations have inadvertently disclosed the presence of the few gravesites that have been found from ancient times on the reservation. Burials have been found at the bases of rock outcroppings, and at the bases of talus slopes. Outside of the Reservation, they have also been found along old river terraces. Burials could also be recent, such as "missing persons", and it would be wise to inform tribal police or other authorities if a burial is inadvertently discovered during logging or road building operations.

Battle Pits. A number of "battle pits" have been recorded on the Reservation. Some of these are on the edge of forest lands, or nearby where roadways giving access to the timber lands have already endangered them. The Kootenai at Elmo attributed these to their ancient predecessors, a people whom they referred to as "The Koyokees". Whether these Koyokees were Salishan speaking people, or more recent Blackfeet, is undetermined. The pits were usually made in haste; hence, sometimes it is difficult to distinguish them from holes left where large trees such as ponderosa pines have been blown over by winds. Others, however, may have crude but discernible rock walls along portions of the pit walls, and in one instance, there were several pits interconnected with trenches (Site 24 FH 1001).

Seldom are relics found in these pits; hence, their identity cannot be made more specific through association with human-made specimens. Some have been found at the edges of timberlands while others are on lowlands, and would not be affected by timber operations. Sometimes, however, they may be found at mountain passes, or on low passes between river drainages.

Debarked Trees. Living trees, partially stripped of their bark on one side, are not usually recognized for their possible archaeological or historical value. More commonly, they are thought to be natural in origin. Yet, throughout the West they are becoming more and more recognized for their cultural significance. Sometimes, moreover, a campsite can be found nearby.

The explanation for them is simple. During the springtime, when the sap is running up the trees (perhaps in March or April) the juices are edible and even regarded as a delicacy. Children especially were fond of the cambium layer at this time, and for weeks it was eagerly gathered and eaten. It could not, however, be stored for future use as there were no known techniques for preserving it.

Several kinds of trees were debarked. These were mostly pines, but some deciduous trees such as young cottonwood (Populus sp.) also provided the sap. The practice has been discouraged by foresters since the 1920's since it damaged the trees, and reduced the value of the timber.

Usually, the debarking was done by women. First, a horizontal cut about a foot long was made across the trunk. The cut was made as deep as the woody part of the tree. Then it was pried away above the cut with a long, wedge-shaped pole. This was accomplished by inserting the pole upward underneath the bark to serve as a lever. The bark, now partially loosened, was pulled away by hand. The scar on the tree was usually in the form of a long triangle, straight on the bottom where the axe had cut, and converging several feet above at an apex. Debarked trees are still apt to be found in forests, and usually there may also be an occupation or campsite nearby.

Ceremonial Grounds. Almost all of these are of recent origin, and questions of their care and preservation could be a matter for tribal religious leaders and tribal authorities to determine.

Some ceremonial grounds are located in small clearings within the woods, but they are usually in lower elevations. Some are on allotted lands, or on private lands. Some ceremonial grounds are described specifically in Appendix C.

Hot Springs. In the old days, hot springs were not only used for bathing people, but sometimes their medicinal properties were also utilized for horses. In some cases, slight dams made of rocks and earth were constructed to raise the water level to make them deep enough to bring horses into the baths.

Eagle-Catching Pits. These could be partially dug in the ground, or, like battle pits, in talus debris. Some were made by removing rocks and piling them into a circular wall about ten to twelve feet in diameter. Then a flat, flimsy roof was placed across the structure.

Bait placed outside attracted the birds, and when they landed on the structure, their feet were grasped by someone inside the pit. Hill tops and ridge crests were favorite places for locating eagle pits.

AESTHETIC CONSIDERATIONS

The Flathead Indian Reservation lies astride an important national north-south travel route (U. S. 93) extensively used by recreationists for travel to and from major national amenity resources (Glacier and Yellowstone National Parks, National Bison Range, and Flathead Lake). The eastern edge of the reservation -- formed by the spectacular Mission Mountains -- is a superlative enhancement for those travelers and forms a magnificent backdrop to those living in the Flathead and Mission Valleys. On the southern and western boundaries of the Reservation, smaller, more rounded, forested ranges also provide significant aesthetic value for those viewing them.

Timber harvest and associated roads may alter the aesthetic attractiveness of characteristic landscapes. These activities modify the landscape dominance elements (form, line, color and texture) to varying degrees depending on the design and intensity of the timber sale and the design and location of roads. For areas which are highly visible and viewed by individuals who value aesthetics relatively highly, modifications in the characteristic landscape tend to produce negative amenity, social, psychological, and political consequences. Such issues are magnified when the landscape is a distinctive one, such as the Mission Mountains. Thus, it is important to inventory and evaluate aesthetics and incorporate this value into timber harvesting and road design. The purpose of this section is to broadly examine the aesthetic values of the forest resource on the reservation with a view toward providing greater understanding of what areas may be more sensitive to timber harvesting than others. The U.S. Forest Service Visual Management System (1973, 1974) is used in a generalized way to form the basis for this examination.

Some Basic Concepts

There are numerous ways of describing and classifying landscapes. However, the overall character of a specific landscape is "created by its unique combination of visual features (such as land, vegetation, water, and structures) as seen in terms of form, line, color, and texture (U.S. Forest Service 1973). The last four terms may be described as dominance elements in the landscape and can be used to typify a characteristic landscape. All four elements are present to varying degrees in a landscape, with form generally being the strongest and texture the weakest. How the dominance elements are "put together" strongly influences the visual character and quality of an area and hence its value as perceived by humans.

Variety is another concept which is important when assessing visual resources. Generally, variety (rather than monotony) is desirable. What this means is that characteristic landscapes with variations in one or more of the dominance elements will generally be viewed with greater pleasure than a monotonous one. For example, a large unbroken canopy of dense lodgepole pine would have little variety compared to another area typified by small, irregular openings, meadows, and ponds. Landscapes with variety are generally of greater visual quality than those without. Viewers are usually more sensitive to human-induced changes. On the other hand, monotonous landscapes, particularly forested ones, tend to display forest manipulations more easily than other areas when such changes do not follow naturally occurring form, line, color, and texture.

Finally, managers of commercial timberlands are concerned with human-induced deviations from the characteristic landscape. These deviations are in the form of timber sales and road construction activity. Harvesting timber does alter the landscape. Generally, it is desirable in visually sensitive areas to design these alterations (where permitted) such that they borrow or follow the naturally occurring form, line, color, and texture of the characteristic landscape.

The Process

To discuss the aesthetic and visual resources of the commercial timberlands of the Reservation, the U.S. Forest Service Visual Management System was used in a generalized manner to inventory the reservation. This sytem is a well-established approach to the problem of visual resource management within a multiple use context. The purpose of using the system here is only to provide an overview of aesthetic resources on the reservation. A more detailed and thorough analysis and evaluation is required before such values can be incorporated into timber sale and access road design[17]. The inventory used the following steps:

1. The process begins with identification of landscape character subtypes. These are areas of land which have common

---

[17] It would be useful for the Bureau of Indian Affairs to fully conduct the visual resource inventory in order to integrate these resource values into timber harvesting plans. This would help insure against the controversial negative visual impact of timber sales and road construction.

distinguishing visual characteristics and are used to classify physical features as to their degree of scenic quality (U.S. Forest Service 1974). The subtype is the unit of analysis for the remaining steps.

2. The distance zones of each character subtype are developed. In using the Visual Management System, the distance zone of the subtype from the nearest state or federal highway on the Reservation was used. This will result in identifying area sensitivity according to the strictest criteria. Three distance zones are used: 1) foreground -- 1/4-1 mile, 2) middleground -- up to five miles from the observer, and 3) background -- greater than five miles from the observer.
3. The variety class for each character subtype is estimated by classifying each landscape into a degree of variety. The Visual Management System notes "the classification is based on the premise that all landscapes have some value, but those with the most variety or diversity have the greatest potential for high scenic beauty." Three variety classes are used: distinctive, common, and minimal. Criteria for determining variety class are found in the Visual Management System handbook.
4. Identifying sensitivity levels for each landscape was the final step used here. Sensitivity refers to the estimate of the viewer's concern for scenic quality. Generally, landscapes which can be seen from routes which are frequented by large numbers of recreationists, such as the highways on the Reservation, usually have the highest levels of sensitivity.

Three levels of sensitivity are estimated based on several assumptions concerning the nature and amount of traffic flowing through the reservation.

The final step in the Visual Management System is usually the establishment of visual quality objectives which describe the degree of acceptable alteration of the characteristic. This was not done here since the objective was only to provide an overall assessment of treatment on scenic resources, not to develop management prescriptions.

Aesthetic Resources

The analysis identified five distinctive character subtypes on reservation commercial timberland. More detailed analysis may identify additional subtypes. The subtypes identified on the reservation include:

1. Mission Mountains. This character subtype forms the eastern boundary of the reservation. It consists of steeply sloped lands rising to sharp, nonvegetated pinnacles, mountaintops, and ridges, particularly in the south. The Mission Mountains dominate the visual experience for travelers along U.S. Highway 93 between just east of Ravalli to Polson. The mountains serve as a focal point for the visual experience of individuals travelling east between Ravalli and St. Ignatius. The overwhelming visual character and significance of the mountain range cannot be overstated. There are currently few visible human-induced changes in this landscape. The Mission Range is one of the most scenic areas of wild

country in the United States. The Mission Mountain Tribal Wilderness Management Plan provides a general description of the range:

> "The Mission Range, flanked to the south by the Jocko Valley, rises abruptly in a spectacular jumble of rugged peaks that tower 7,000 feet above the Mission Valley floor. As it trends north, it gradually decreases in elevation and width until it finally disappears beneath glacial outwash near Big Fork. The southern end of the range fits well with the generally perceived notion of wilderness: an area of magnificent peaks, dotted with literally hundreds of high lakes separated by waterfalls and high alpine meadows. A few small glaciers still exist on the highest peaks. Many of the animals that are characteristic of wilderness--the grizzly, elk, wolverine, lynx, and cougar--continue to live in the area."

The area has had a number of political wilderness designations, beginning in 1931, when 67,000 acres were designated as a primitive area. The land at higher elevations within the range is currently managed under a 1979 Tribal Council wilderness designation (a designation that is independent of the Wilderness Act). See the Tribal Wilderness Ordinance, Exhibit A, for further details. The Mission Mountains Tribal Wilderness includes 89,500 acres. The U.S. Forest Service manages about 73,000 acres contiguous to the tribal wilderness on the eastern side of the Mission Divide as a wilderness area.

2. McLeod Peak Area. This subtype is located in the southeastern portion of the Reservation with the Jocko River forming the northern boundary and the foothills in the Evaro area constituting the western boundary. The western part of this area is characterized by several deep valleys, steep

forested slopes, and a relatively high topographic relief. This area is highly visible from U.S. Highway 93. The eastern part of the subtype is generally flatter, composed of continuous forest with the South Fork of the Jocko River deeply entrenched. It is not visible from major highways. This character subtype has had extensive timber harvesting and road construction with some of this activity visible from U.S. Highway 93.

3. Jocko Hills. This subtype is bounded on the south by the Jocko Valley, on the east by the Jocko River, and on the northeast by Dry Creek. It consists of rolling to moderately steep forested hills. The southeastern and northeastern portions of this area are somewhat visible from U.S. Highway 93. The central plateau-like component is not visible from the highway. The eastern portion of this area shows the results of extensive timber harvesting and road construction.
4. Nine Mile Divide. This subtype consists of rolling to moderately steep and heavily forested terrain, with occasional non-forested mountain peaks reaching about 8,000 feet in elevation. Several scattered lakes dot the higher elevation areas. The subtype is located on the southern portion of the Reservation east of U.S. Highway 93 and south of State Highway 200. Portions are visible from both highways, even far to the north (Ronan) as well as from the National Bison Range. While many parts of

this area have been subject to timber harvesting, there still remain relatively extensive areas free of human alteration.

5. Thompson Divide. The Thompson Divide forms the western boundary of the Reservation. It consists of rolling to moderately steep forested terrain, yet relatively narrow in width. Most parts of this subtype are visible from State Highways 28 and 382. Timber harvesting has occurred in the past throughout the area.

Table 15 shows the evaluations of each subtype in terms of distance zone, estimated variety class, and sensitivity level. When making estimations of sensitivity level, it was assumed that all parts of the subtype were visible from the nearest state or federal highway. This assumption is, of course, questionable, but was made only for ease of analysis. More detailed analysis for the purpose of establishing management prescriptions would require that this assumption be changed. The discussion below briefly interprets the results of this broad visual assessment.

1. Mission Mountains. This subtype, as previously noted, provides a magnificent background to the Flathead and Mission valleys. It was rated as distinctive in variety class because of its outstanding visual quality, national importance as a natural area, and its unusual and outstanding landform character. Sensitivity was rated high because of the national importance of U.S. Highway 93,

the nature of the traffic using the highway, the subtype's relation to Flathead Lake, and its value as a scenic backdrop to many residences in the area.

2. McLeod Peak Area. This subtype was rated common to distinctive in variety class. Generally, the western portions were rated distinctive and the eastern component, common. These ratings were given because of the relatively large topographic relief and deeply entrenched valleys. The common rating was given because of continuous forest cover and rolling terrain characterizing that area. Sensitivity was rated low to high depending primarily on visibility from U.S. Highway 93.
3. Jocko Hills. This subtype was rated minimal in variety class, primarily because of little diversity in form, line, color, or texture. It was rated low in sensitivity because most of the area is not visible or only minimally visible from U.S. Highway 93.
4. Nine Mile Divide. This area was rated as common in variety class. This means that the landscape features exhibit some variation in form, line, color, or texture, but the amount of such diversity is relatively common, and not unusual. The area was determined to be in the moderate sensitivity class because of intermittent visibility from U.S. Highway 93 and State Highway 200 as well as its background function for other parts of the Reservation. The Nine Mile Divide does contain portions,

which upon more detailed analysis, may be rated as distinctive in variety and high in sensitivity, particularly those areas adjacent to the higher peaks.

5. Thompson Divide. This area was rated as minimal in variety class. There is little diversity in dominance elements, and it contains few highly attractive features such as lakes, larger streams, and waterfalls. It was rated moderate in sensitivity because most of the area is visible from a state highway.

This completes the broad aesthetic analysis of the commercial timberlands of the Flathead Indian Reservation. It should be re-emphasized that the purpose here was simply to classify visual resources. More detailed analysis is required prior to the development of management prescriptions.

Table 15. Evaluation of character subtypes, Flathead Indian Reservation.

Subtype	Distance Zone	Variety Class	Sensitivity Lev
Mission Mountains	Background	Distinctive	High
McLeod Peak	Middle Ground-Background	Common-Distinctive	Moderate-High
Jocko Hills	Middleground	Minimal	Low
Nine Mile Divide	Middleground	Common	Moderate
Thompson Divide	Middleground	Minimal	Moderate

Part 2

IMPACTS OF POLICIES ON ELEVEN RESOURCES

UNIVERSITY OF MONTANA · 1893 · LUX ET VERITAS

IMPACTS OF POLICIES ON ELEVEN RESOURCES

I. Fire Management Program

A. Impacts of Fire Suppression Policy

Background: Historically BIA's policy has been to take action to suppress nearly all fires on the reservation. As most other forest land managing agencies have done, the B.I.A. has conducted an active public educational program to institute a "total suppression" fire management policy. It is expected that all fires on the reservation will be extinguished. This policy, however, does not acknowledge the beneficial effects fire can have on the environment or the role fire plays in keeping check on fuel hazard build-up in the forest. Oftentimes too, resource values at risk from a fire are not commensurate with fire suppression costs, therefore making a "total suppression" policy economically questionable.

a. Geology

Description of the Impacted Environment

Commercial timber lands of the reservation.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., rapid control of all destructive wildfires.

Environmental Consequences

Direct Impacts: No direct impacts are anticipated. Impacts on the soil and soil erosion are covered in the soils section.

Indirect Impacts: No indirect impacts are anticipated. Impacts of erosion and sedimentation are discussed in other sections.

b. Surface Hydrology

Description of the Impacted Environment

The impacted environment consists of the entire land area of the Reservation including the Mission Wilderness, Jocko Primitive Area and the Nine Mile Divide.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., rapid control of all destructive wildfires.

Environmental Consequences

Direct Impacts: Impacts will differ according to past fire history, fire ecology of the vegetation, past and present cultural resources, and past and present cutting and slash disposal practices. Total suppression provides short-term maintenance of existing water yields, regiment and quality. Otherwise, hydrologic impacts are area-condition dependent. Fire Groups are defined in Table III-5 of the 1982-1991 Forest Management Plan. Fire Group 4 (low elevation, arid) may show no increases in yield or timing changes following "let burn" or prescription fires. Water quality deterioration (sediment production) tends to increase with disturbance area and fire intensity. Chemical pollution (nutrient release) is never serious. Sediment delivery can be minimized with good riparian zone protection.

Fire Group 6 vegetation is elevationally transitional between rain and snow domination. Water yield increases may be expected and increase with precipitation. Changes in timing are due to snowmelt desynchronization; therefore, peak discharges may increase or decrease. Sediment delivery from disturbed areas tends to be proportional to excess precipitation or snowmelt runoff. Again, sediment delivery can be minimized with riparian zone protection.

Greatest water yields may be expected from Group 11 habitat types. As pointed out in the plan, these types tend to be riparian in nature, and exhibit a low natural fire frequency. When they do burn, a stand replacement fire (one where the overstory is destroyed) usually occurs. Major disturbance in these types, whether because of naturally occurring high soil moisture content or because of proximity to stream channels, would have the greatest likelihood of significant water quality deterioration.

Indirect Impacts: Total suppression may provide fuel buildup and reduction of natural fire frequency. Water yields and sediment yields increase with the size of the disturbed area and fire intensity. The consequences of big fires are probably unacceptable, due to the excessive sediment loads and surface erosion.

Water yield increases, changes in timing and sediment yield increases are temporal in nature. The decrease in water and sediment yield tends to be exponential with time, and is highly correlated with site productivity. Sediment yields decrease 3-10 years following disturbance. Hydrologic recovery may be complete in less than 10 years following disturbance in Group 11 habitat types. Recovery in groups 4 and 6 may take over 50 years.

There are other factors which could have been mentioned as well, and it is apparent that these factors may act additively or compensatorily.

Finally, a very important concept is that of vegetative/hydrologic recovery. As revegetation occurs following disturbance, water yields and timing return to approximately their original condition (sometimes slightly greater, sometimes slightly less). Very productive sites recover very quickly, low productivity sites recover very slowly. Thus, the duration of impacts on surface hydrology is a direct function of productivity. Sediment yield recovery is also a function of productivity. The faster ground cover returns to a site, the sooner rainfall detachment is eliminated, overland flow is impeded and infiltration rates improve. Regrowth is fast in riparian areas so that delivery distance increases rapidly regardless of site productivity, but the total increase is even more rapid on productive sites.

c. Range

Description of the Impacted Environment

The impacted environment includes all rangelands and transitory ranges within the forest zone on the Flathead Indian Reservation.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., rapid control of all destructive wildfires.

Environmental Consequences

Direct Impacts: The fire suppression policy will have little direct impact on the range resource.

Indirect Impacts: The long-term impact of fire suppression would be to decrease livestock forage and that for some species of wildlife. However, timber harvesting could be used to increase transitory range (those grazing areas where forest canopy has been thinned or removed) which would provide a forage resource without harming the timber resource. Fires have played an important role in setting back plant succession and in recycling nutrients in forest communities. Within grassland areas fire has been important in increasing the palatability of forage plants. Large burns would increase livestock forage in the form of transitory range for up to 20 years. Large areas of transitory range would be valuable for livestock since these areas would be more easily managed. However, large burns may be detrimental to elk habitat until cover became reestablished.

Since allowing fires to burn in commercially-valuable timber would be an impractical management policy, prescribed fires should be used to improve wildlife and livestock forage and accessibility. Prescription burns could be used after commercial thinning to remove slash, recycle nutrients and reduce the fire hazard of the stand.

Seral species such as ponderosa pine and western larch have the greatest chance for establishment on burned sites with exposed mineral soil or where duff is reduced to depths of 1/2 inch. For Douglas-fir sites where ponderosa pine and western larch could be used to reduce mistletoe hazard, fire could be used to increase livestock forage.

d. Soils

Description of the Impacted Environment

The present policy of total suppression will not significantly impact areas where natural fire frequency has historically been the greatest. These are exposed, dry, south-facing slopes where lightning fire frequency has traditionally been the greatest. Some data have shown that these areas burned an average of every eight years before present suppression policy. Moist areas, for instance of western red cedar climax series, have not had a history of frequent fires and therefore would be less affected. Many moist sites occur in valley bottoms or riparian zones.

Soils on steep, south-facing slopes are mostly formed in Belt bedrock (argillites and quartzite). They are shallow, coarse textured, stony and have low water-holding and nutrient-storage capacities. The sandy nature of these soils is responsible for their susceptibility to erosion.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., rapid control of all destructive wildfires.

Environmental Consequences

Direct Impacts: Wildfires have always been a reality in western Montana; in fact, Indian people have used fires for certain cultural objectives (Barrett 1982). The present policy of total suppression allows fuel buildup in some areas of up to 40 tons/acre (p. 95 of The Plan). These levels could lead to a major conflagration with a major loss of resource values, especially timber.

Impacts on the soil will not be great and will be limited to the duff layer. Organic layers accumulate under a policy of total suppression. Soil temperature fluctuations will be moderated and infiltration capacities increased by thicker organic horizons. Also, an increase in the amount of some nutrients will occur, particularly nitrogen tied up in the organic matter. But the overall impact of the duff increase will not be very significant.

Evidence from one study (Stark 1977) suggests that fires hotter than 300° C (572° F) at two inches into the soil result in nutrient losses. These losses were judged not to be significant to the long-term productive capabilities of the soil (Stark 1978). Results are from a sandy, skeletal soil of the Holloway series on steep slopes. In general, if the soil is young and moderately fertile, low temperatures ($<572^{o}$ F overall at two inches in the soil) will not cause significant losses of soil productivity provided that erosion does not occur. Most wildfires generate temperatures $>572^{o}$ F at two inches in the soil, unless they are crown fires or storm fires. Hot fires alter the exchange capacity and infiltration characteristics of soils as well (Eron 1977).

Another study (Stark et al. 1983) has reported a potential for nutrient shock on poor granitic soils with or without an andic cap when the initial levels of available ions are very low. Nutrient shock is a condition of the soil where one or more biologically essential ions are temporarily limiting to tree growth. Such sites will grow brush until weathering releases more nutrients to levels sufficient to support trees. These are present in some areas of the reservation and identified on SCS and survey maps.

These soils may enter nutrient shock if a hot fire or logging and fire destroy most of the organic matter. Such soils are said to be "chemically fragile" or unable to grow the next 3-4 forest cutting cycles on existing nutrient reserves after intensive harvest or hot burns.

Chemically fragile soils are not thought to be extensive in the area (Stark et al. 1983). Soils in groups 1, 4, 6, 19, 20, 21, 22, 23 and 25 (Appendices B and C), are most likely to show nutrient shock. Chemical analyses of soils and vegetation are needed to verify if a soil is chemically fragile. Tentative ratings of chemically fragile soils can be made in the field for the wetter sites, but tree growth is poor (< 20 rings/inch in trees 80 years of age, Class I) with moderate to good stocking levels. Slow growth on these sites may be related to cold soils as well as to nutrients so that a nutrient analysis is needed to verify the cause of slow growth. None of the soils in this area are old enough to be susceptible to irreversible loss of tree growth potential (long-term) from hot fires (Stark 1977). Soils in groups 20 and 21 may be damaged by hot fires that make them more alkaline while soils in group 23 (acid) may benefit from fire.

Significant nutrient losses can be expected on any soil where large fuel loadings are consumed, where the nutrient content and anion and cation exchange capacities are low, where soils are shallow (< 20 inches), and where rainfall is high enough to move water beyond the maximum depth of penetration of the feeder roots. Habitat type Groups E and F (see Ecology section) often have these types of soils. Fire also destroys allelopathic chemicals that can alter vegetational composition. Allelopathic chemicals are those that inhibit growth of other plants. Removal of fire may favor undesirable understory species because of allelopathy.

Indirect Impacts: The cumulative, long-term impact of this alternative will be a gradual change in the natural state of those stands where high amounts of fuel build up and deterioration in some resource values such as foraging areas for livestock and wildlife and aesthetic quality will occur. Physical soil impacts will not be great. However, a universal fire suppression policy will reduce the long-term losses of nutrients below the feeder roots of mature trees, but it will also reduce the natural fertilizer effects of periodic light ground fires. In some ecosystems where frequent light ground fires have provided nutrient stimulation without massive ion losses from the system, this loss may be critical (Habitat Types -Groups A, B, Table 13). Suppressing all wildfires will reduce the hazard of nutrient shock, as discussed on page 110, but may result in nutrient deficiency on sites which were dependent in the past of frequent light fires.

Suppression of wildfires will leave more woody material on the forest floor. Harvey et al. (1979) have shown that large woody material greater than 12 inches in diameter provides a temperature and moisture stable substrate for nitrogen-fixing organisms and habitat for mycorrhizae. Low burn frequency favors mycorrhizae needed for the uptake of nutrients by trees.

Traditionally, hot fires are thought to partly remove belowground stumps that harbor diseases such as root rots. Fire suppression may mean having to research other means to deal with soil-inhabiting disease organisms. Smoke from fire may reduce the germinative energy of the spores of pathogens, thus slowing their spread. Normally, a wildfire burns the hottest in forested areas that are dense and diseased or insect-damaged, or overmature with high dead fuel content. These are the stands that need sanitation from fire.

Adverse effects can be mitigated by control burns during logging, and identifying chemically fragile soils that are subject to nutrient shock and concentrating efforts to keep fire out of these areas.

e. Timber and Other Vegetation

Description of the Impacted Environment

The impacted environment consists of the entire land areas of the Reservation including the Mission Wilderness, Jocko Primitive Area and the Nine Mile Divide. Impacts will differ according to past fire history, fire ecology of the vegetation, past and present cultural resources, and past and present cutting and slash disposal practices.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., rapid control of all destructive wildfires.

Environmental Consequences

Direct Impacts: The direct impact of fire suppression policy will be the short-run protection of commercial timber resources. Without active fuel management of prescribed fire use, all other vegetative resources will be degraded as shrubs, forbs and grasses are shaded out by conifer trees. This impact will be greatest in Fire Groups 4 and 6 because of the reduction in natural fire frequency. In addition, the benefits of fire for nutrient cycling will be lost, although some nutrients can be volatilized. Fuel reduction and natural thinning are also lost benefits.

Timber value is lost when commercial land is burned over by high intensity fires. Immediate suppression will save commercial timber.

Fire does provide species control (intolerant species are favored by burning) and some disease control through soil sterilization. Lack of burning appears to favor conditions for spruce budworm outbreaks.

Indirect Impacts: Indirect impacts of an area-condition dependent fire suppression policy are closely related to the fire ecology of the various forest habitat types. Commercial timberlands in Fire Groups 4 and 6 are affected by the exclusion of natural periodic ground fire. Under fire exclusion natural fuels accumulate. These combined with logging activity fuels create fire behavior potentials that would likely destroy the timber resource.

An active, well designed fuel management plan for commercial timberlands has been developed for the reservation. This program, which includes the use of prescribed fire to provide positive effects of wildfires that are supressed, is vital for effective forest management on the reservation. Collection of brush disposal funds from the timber purchasers is necessary for the prompt treatment of logging activity fuels.

The historic fire frequency on other forest fire groups has been altered by fire suppression, but not to the degree that Fire Groups 4 and 6 have been altered. An active timber harvesting program, combined with effective slash treatment/site preparation, may substitute for the past role of fire. To be effective, an *a priori* activity fuel appraisal system should be added to the fuel management plan. Such a system would allow the evaluation of potential fuel problems before any cutting takes place. In addition, this system could be used to prioritize treatments and an evaluation of wood utilization options.

In other vegetation types the exclusion of fire generally decreases forage and browse production and quality. The area-condition dependent policy will allow for more wide scale use of prescribed fire by artificial or natural ignition techniques. Use of prescribed fire as described in the plan will greatly increase forage and browse production on the reservation.

Total fire suppression results in loss of time and money that could be better spent elsewhere.

f. Wildlife

Description of the Impacted Environment

All forms of wildlife, especially those species that depend upon forested areas for their habitat.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., rapid control of all destructive wildfires.

Environmental Consequences

Direct Impacts: There are no significant adverse effects for the wild ungulates and old-growth timber dependent species. However, there may be some temporary displacement of the wildlife by fire crews, airplanes, and other suppression activities.

Indirect Impacts: The rapid control of wildfires may reduce the creation of early seral foraging areas for deer, moose, and elk; however, fire suppression will help protect cover. Logging and site preparation may mimic the action of wildfire in producing seral foraging areas. Broadcast burning is preferable to mechanical scarification in this regard. Mountain goats and bighorn sheep are generally not in the forests and are not influenced by forest fires as much as deer, moose, and elk; however, control of grass fires may insure the retaining of forage for bighorn sheep on their natural feeding areas. The long-term effect of controlling wildfires is a reduction of brush fields, especially important for deer and elk winter range.

Protection from wildfires of old-growth forests or those that are nearly old-growth stands will benefit animals that depend on this type of an environment.

g. Fisheries

Description of the Impacted Environment

The impacted area is the entire watershed and associated fisheries on the reservation. Impacts will be site specific and will depend upon past fire history (e.g., existing fuel load) and current management practices.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., rapid control of all destructive wildfires.

Environmental Consequences

Direct Impacts: Wildfires are a natural perturbation in western Montana and are a contributing factor to the current environmental condition. Recent policies of total suppression may have provided short-term benefits which include a relatively stable water yield and sediment load. However, this policy may also result in the accumulation of fuels and the possibility of an intense, catastrophic fire. The impact of wildfires on fish populations is largely mediated through alterations in water yield and sedimentation. Since these parameters are strongly influenced by the intensity of the fire, it is clear that catastrophic wildfires will have a detrimental impact on the Reservation's fish populations.

Additionally, the nature of a fire's impact may be determined by the burn site. Although we are unable to quantitatively estimate sediment yields from any particular site, it is clear that low gradient areas will yield a lower increase in sedimentation than high gradient sites. A policy of routinely assessing the site specific impact of a fire would be most appropriate from a fisheries management standpoint. Water yield increases may be lowered by protecting riparian zones.

Indirect Impacts: Alterations in water yield and increased sedimentation can have an adverse impact on fisheries both in terms of spawning and food quantity. The duration of the adverse impact will be site specific and will continue until adequate cover is re-established. We are unable to estimate the length of impact from available data. It is also clear that increased water yields could alter within stream erosion rates and channel characteristics. Maintaining an adequate riparian zone may lower these impacts.

h. Wilderness

Description of the Impacted Environment

The impacted environment consists of the entire land area of the Mission Wilderness and Jocko Primitive Area. Impacts will differ according to past fire history, fire ecology of the vegetation, past and present cultural resources, and past and present cutting and slash disposal practices.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., rapid control of all destructive wildfires.

Environmental Consequences

Direct Impacts: A wilderness fire management program, where naturally ignited fires are allowed to run their course, insures the natural process of fire. This would be lost when fires are suppressed. The areas under consideration commonly include high elevation forest types in rocky areas with low site productivity. Fuels in such areas have not been greatly altered by the fire suppression policy of the past. The inaccessibility of these areas dictates very high fire suppression costs. On the other hand, the cost of the loss of a wilderness experience due to the sight of fire lines and felled timber cannot be calculated.

Fire management in wilderness is the maintenance of process. It is not object management as it is for the rest of the reservation. Trees, forbs, shrubs and grasses will be burned and blackened. Some will sprout and grow back, others will be killed. Fire behavior has been observed in other wilderness fire management zones in Montana and Idaho. These observations indicate that fires are limited in intensity so that less than 1% of the burned area will be subjected to actual "crown fire".

Indirect Impacts: The indirect effects and impacts depend on the actual plan developed for the fire suppression in wilderness areas on the Reservation. A wilderness fire management plan is presently being developed. Indirect impacts include the destruction of commercial timber when the fires burn outside the wilderness boundary, and erosion and vegetation disturbance caused by fireline construction. To avoid such indirect impacts, the wilderness fire management plans should consider:

1. Study of the fire history for the area, including size and location of fires relative to wilderness fire management boundaries,
2. Development of defensible boundaries, not just those of the wilderness as shown on a map,
3. Recognition that very small wilderness fire management areas will nearly always present problems in keeping fires within designated boundaries and in costs of fire suppression,
4. A constraint on the number of natural fires that will be allowed to burn relative to the regional fire situation,
5. A constant maintenance of interagency agreements dealing with boundary restrictions and fire suppression responsibility, and

6. N.I.F.Q.S. qualifications for fire monitors that reflect the probability of fire moving outside wilderness fire management boundaries. The closer to the boundary the fire is, the greater the fire behavior fire suppression qualifications needed.

i. Recreation

Description of the Impacted Environment

The affected environment includes all commercial timberland with recreational value that is subject to this policy.

The nature of the impacted environment will vary somewhat according to past fire history, fire ecology of the vegetation, past efforts at fire suppression, and past or present cutting and slash disposal practices.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., rapid control of all destructive wildfires.

Environmental Consequences

Direct Impacts: The primary impact will be a minimization of the role natural fire would play in creating a visually appealing and recreationally attractive vegetational mosaic. Otherwise, fire suppression would have a minimum direct impact. Suppression of wildfire would be beneficial from the perspective of visitor safety.

Indirect Impacts: Fire suppression in commercial timberland may affect fire spread into adjacent tribal wilderness lands and other non-commercial areas which have recreational value. The lack of fire and its resulting impact on vegetation may negatively impact visitors' experience, especially where the fires would provide for maintenance of an open understory in the forest.

j. Archaeology/Cultural Heritage

Description of the Impacted Environment

The impacted environment consists of the entire land area of the Reservation including the Mission Wilderness, Jocko Primitive Area and the Nine Mile Divide. Impacts will differ according to past fire history, fire ecology of the vegetation, past and present cultural resources, and past and present cutting and slash disposal practices.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., rapid control of all destructive wildfires.

Environmental Consequences

Direct Impacts: Serious direct impact may occur to the archaeological/cultural heritage because of fire suppression activity in areas selected for total suppression and conditional fire suppression actions. Pre-attack Planning should be carried out on the Reservation lands subject to wildfires. Essentially, Pre-attack Planning is a system for collecting, evaluating and recording fire intelligence data for a given planning unit. The system documents existing and proposed fire control lines, facilities, fuelbreak, helispots, etc. Local fuel conditions are presented as are travel times, topography and manpower requirements. If a pre-attack program were instituted, cultural resources in these areas could be surveyed and pre-attack control lines and unit boundaries could be directed around them. Fireline construction, in an emergency situation without Pre-attack Planning, may inadvertently destroy archaeological and cultural resources. Archaeological sites and areas of cultural and religious significance have been surveyed and identified. Locations are confidential. Actual fires will have little impact on most archaeological/cultural resource since it is likely that such areas have burned many times in the past. The slight possibility of smoke blackening of valuable rock paintings can be eliminated by careful hand clearing of fuels adjacent to the sites.

Indirect Impacts: Indirect impacts take the form of vegetation change and plant succession. With fire exclusion, shrubs and trees may hide archaeological/cultural resources. This further increases the likelihood of destruction by fire suppression equipment. Fuels produced by dense vegetation may also lead to extreme fire behavior and high fire intensity that may destroy such resources.

k. Human and Community Developments

Description of the Impacted Environment (Sociological Analysis)

All Reservation lands, both public and private and those adjoining lands. All lands within visual access.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., rapid control of all destructive wildfires.

Environmental Consequences (Sociological Analysis)

The discussion on the effects of fire (Section III.E.2.c (3) (b) of the Management Plan) establishes 11 considerations with respect to fuels management and fuels treatment. These items also provide guidelines as to appropriate treatment methods. Item 10 which deals with adjoining public and private lands should either be expanded so as to deal with non-adjoining lands, the fuel's impact on them, and the aesthetics of the region, or another item (12) should be added to provide this consideration. Item 7, dealing with religious and cultural impact, should either be amended to include non-tribal religious and cultural activities and tribal and non-tribal recreational activities or another item (13) should be added to the list to provide for this consideration. The plan should also consider a lower level of suppression in the wilderness and primitive areas, keeping in mind potential wildfire behavior. Perhaps prescribed burns in these areas to manage fuel levels at low costs could be considered.

Direct Impacts (Sociological Analysis): Wildfires lead to loss of timber, social, cultural, religious and recreational resources. There would be a short-term loss of aesthetic quality of the area. Fire suppression would help preserve these resources. However, suppression costs might be difficult to justify.

Indirect Impacts (Sociological Analysis): None are anticipated.

Description of the Impacted Environment (Economic Analysis)

Economic well-being of tribes, tribal members, and related employment.

Environmental Consequences (Economic Analysis)

The plan should consider a lower level of suppression in the wilderness and primitive areas, keeping in mind potential wildfire behavior. The lower level of suppression would allow wildfires to remain a natural part of these areas, and keep fire suppression costs at a minimum. Perhaps prescribed burns should be considered in those areas where it is desirable to manage the fuels where wildfires might be undesirable and more expensive to suppress.

Direct Impacts (Economic Analysis): Suppression costs are difficult to justify.

Indirect Impacts (Economic Analysis): There could be adverse effects on Indian fire crews due to a loss of employment.

l. Threatened and Endangered Species

Description of the Impacted Environment

All forms of wildlife which are considered threatened or endangered.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., rapid control of all destructive wildfires.

Environmental Consequences

Direct Impacts: No significant effects.

Indirect Impacts: Fire suppression may adversely impact the prey species of the gray wolf, namely the beaver (*Castor canadensis*), snowshoe hare (*Lepus americanus*), and, in some areas, deer. Suppression may also adversely impact the peregrine falcon population by altering the numbers and species of birds and/or rodents which are considered the small prey of the falcon. The suppression policy may also protect the daily perch or roost sites, and the nesting areas of the bald eagle.

Wildfires in forest habitats that have huckleberries, especially blue huckleberry (*Vaccinium globulare*), as understory species often create valuable feeding areas for grizzly bears. Fire suppression will prevent the creation of these heavy berry production areas. Logging and broadcast burning in forest habitat types with blue huckleberry in the understory may mitigate the effects of this policy. Mechanical scarification will initially destroy huckleberry plants.

m. Ecological Interrelationships

Proposed Alternative (No Action Alternative): Continue present policy, i.e., rapid control of all destructive wildfires.

Environmental Consequences

Direct and Indirect Impacts: Total wildfire suppression removes a natural ecological force from the environment. Naturally-occurring wildfires reduce fuel accumulations but also destroy habitat for mycorrhizae and nitrifiers if the fires are intense. Hot fires release nutrients needed for tree growth, but result in aerial nutrient losses as well as solution losses beyond reach of the roots. These losses become more serious with hotter fires ($>572^{\circ}$ F). If more nutrients are released than the soil can store, growth may be slow following fire on poor soils. If large amounts of ash are produced from a fire, the soil pH may shift to a level unfavorable for ion uptake and nitrogen fixation (Stark 1977). Light fires favor resprouting of shrubs which may interfere with tree growth (Stark 1983b), but the shrubs provide food for certain wildlife species and livestock. Light fires are especially important to animals in forest habitat type Groups A, B and C. Hot fires in these or other habitat types will kill the below-ground sprouting structures of many species of grass and shrubs, reducing the value of the area to wildlife or livestock. Hot fires with soil temperatures $>70^{\circ}$C (158° F) at 9-inch depth will kill most huckleberry rhizomes, making the area less suited to bears and certain other wildlife species (Minore et al. 1979). If the trees are large, a fire of high intensity may aid tree growth by removing shrub competition (Stark 1983b). Fires of moderate intensity stimulate nitrifiers even though nitrogen losses during the fire are considerable.

Wildfires are natural cleansing agents of the forest. Smoke alters fungal and bacterial spore germination capacities. Heat kills fungal tissues of disease and mycorrhizal fungi alike. Fire storms can trap and kill both small and larger mammals. Succession occurs only after very hot fires that change the physical, chemical and microclimatic conditions of the site so drastically that it cannot support the original vegetation. Secondary succession after fire is rare in western Montana forests, except for a two-stage sequence to a climax forest type. Much of what occurs after fires is "regrowth" or return of the original species.

The influences of wildfire listed above are only a few of the effects. Uncontrolled fire has many side effects that we do not yet understand. Since wildfire was a natural environmental force, it is reasonable to assume that total suppression for several decades leads to excessive fuel build-up. Should a wildfire occur on these areas, it would probably be a hot, destructive fire with more of the harmful influences than the beneficial ones.

If fire is not allowed to remove fuel accumulations and decay cannot remove the residues fast enough to provide room for regeneration, then the adverse effects of wildfire can be mitigated through controlled burns where fuel loading and meteorological conditions are selected to produce burns of moderate tempature ($\pm$ 570^{o} F) through prescription. There may be irreversible adverse effects on more fertile soils if all fires are excluded. Adverse effects of fire suppression will include excessive fuel accumulations and a reduction of site growth potential.

II. Timber Sale Program

A. Impacts of Sale Size

Background: Sale size affects the forestry program's administrative and technical workload and the overall economics of sawmill and wood procurement operations. It also affects the economic viability of small to mid-sized Indian loggers and stumpage income of the Flathead Tribes. The Bureau and tribes are interested in maximizing economic returns but still providing opportunities to Indian loggers and Indian forest product enterprise.

a. Geology

Description of the Impacted Environment

In essentially the same forest character, the larger the sale size, the greater the potential impact from tree removal in the affected drainage. However, many small size sites could do as much cumulative damage as a few large removal sites in the same drainage, or over a larger region, with respect to erosion and water quality. The rate and adequacy of regeneration is key in these sites.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2 - 10 MMBF, with occasional sales to 20 MMBF.

Environmental Consequences

Direct Impacts: Sale size, in itself, may not affect geologic resources. However, a combination of size, distribution and drainage basin character could dramatically change erosion and sedimentation rates and water quality parameters as a result of sale size.

Indirect Impacts: Should primary geologic factors on a site change (erosion, sedimentation, transport, water quality and quantity) the secondary effects on biotic systems associated with the land and stream channel could also change, thereby affecting wildlife, fisheries and riparian vegetation.

b. Surface Hydrology

Description of the Impacted Environment

The impacted environment consists of the commercial forests of the Reservation and their watersheds.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2 - 10 MMBF, with occasional sales to 20 MMBF.

Environmental Consequences

Direct Impacts: The hydrologic effects of even-age or uneven-age management are not linearly additive. In Region 1 of the U. S. Forest Service, this is recognized as the Equivalent Clearcut Area concept. Harvest of 10 million board feet in a large area under uneven-age management will have less hydrologic consequence than harvest of 10 million board feet taken from a much smaller area harvested by the clearcut method. Similarly, the hydrologic effects of one 40-acre clearcut are greater than the combined effects of eight 5-acre clearcuts.

The most hydrologically conservative timber sale program would be many small sales under uneven-age silvicultural prescription.

Indirect Impacts: None.

c. Range

Description of the Impacted Environment

The impacted environment includes all commercial forest lands of the reservation.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2 - 10 MMBF, with occasional sales to 20 MMBF.

Environmental Consequences

Direct Impacts: Sale size would influence the amount of transitory range but would have little impact on Group A range. Sale size would have direct impacts on livestock forage by increasing transitory range. Larger sale sizes would provide for more livestock range which would be easier to manage. Small sale sizes will increase livestock management problems, especially where livestock are increasing regeneration problems. On small clearcuts, cattle will need to be moved more often to decrease the chances of overgrazing these areas. Sale units having a range in habitat types may present a problem in managing livestock grazing distribution. Even though the cattle will prefer to graze the clearcuts as opposed to nearby forested sites, they may prefer one habitat type over another in a clearcut.

Smaller timber sales would have less of an adverse impact on wild ungulates than would large timber sale sizes for the same acreage.

Indirect Impacts: None.

d. Soils

Description of the Impacted Environment

This management concern impacts all commercial timberlands, essentially forest habitat management types B, C, D, E and F.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2 - 10 MMBF, with occasional sales to 20 MMBF.

Environmental Consequences

Direct Impacts: The decision to accept or reject this alternative is largely an economic one. Direct or indirect impacts of this alternative on the soil resource will be minor as long as the amount of roads constructed is kept to the minimum possible. Roads have a major impact on the soil resource. The soil in the road prism that required thousands of years to form is precipitously mixed, moved and compacted. Ground water flow through the soil is altered and erosion on the cut and fill slopes dramatically accelerated when compared to the undisturbed soil. The road prism will return to a productive site for timber production only after a long period of recovery. The building of a forest road represents an irreversible and irretrievable commitment of the soil to transportation rather than long-range productivity. To the extent that road density must be increased to apply this alternative, long-range productivity will be sacrificed for short-term use.

Indirect Impacts: No cumulative, long-range impacts, other than those noted above, should impinge on the soil as a result of the application of this alternative.

e. Timber and Other Vegetation

Description of the Impacted Environment

The impacted environment differs considerably depending on how many acres must be cut to achieve these volume goals.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2 - 10 MMBF, with occasional sales to 20 MMBF.

Environmental Consequences

Direct Impacts: Reforestation capabilities and capacities must be considered. A large sale in a single seed zone may require more seed and seedlings than available from BIA nurseries. This would have to be determined by the BIA.

To reach a given "allowable cut," many smaller sales will require more roads, and more areas will be disturbed than for a few larger sales.

More roads also reduce the growing acreage. More roads spread noxious weeds through the forest area.

Smaller sales may not allow economical use of advanced logging systems and site preparation methods.

Indirect Impacts: No significant impacts.

f. Wildlife

Description of the Impacted Environment

All forms of wildlife existing on Flathead Indian Reservation.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2 - 10 MMBF, with occasional sales to 20 MMBF.

Environmental Consequences

Direct Impacts: Anytime vegetation is manipulated on an area (such as timber harvesting), the habitats of all wildlife species on that area are changed. For some species the habitat may be enhanced, while for other species the habitats may be adversely affected. The larger the area cut, the greater will be the chance for impact.

Indirect Impacts: Sale size may indirectly influence wildlife because of differences in the frequency and intensity of human disturbance in an area. If sales are large, road building and logging can be confined to only a portion of the sale area at one time, and adjacent areas can be closed to provide undisturbed sites for displaced wildlife. Similarly, small sales offered for the same time period should not be located in adjacent areas.

g. Fisheries

Description of the Impacted Environment

The impacted area is the entire watershed and associated fisheries on the reservation. Impacts will vary in response to particular site characteristics.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2 - 10 MMBF, with occasional sales to 20 MMBF.

Environmental Consequences

Direct Impacts: The size of the sale area in combination with basin topography will have an impact on both water yield and sedimentation. Although numerous small sites may have less visual impact than a few large sites, the cumulative impacts to the fisheries resource may be greater. Studies are needed to determine the influence of sale size on the fish resources in forested areas.

Indirect Impacts: Long-term impacts of sale size are primarily a function of reforestation ability. The ability to regenerate vegetative cover should be considered under any alternative.

h. Wilderness

Description of the Impacted Environment

The impacted environment includes the Mission Mountain Tribal Wilderness.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2 - 10 MMBF, with occasional sales to 20 MMBF.

Environmental Consequences

Direct Impacts: There are three areas of impact on the tribal wilderness from sale unit design and size. These are ecological, social and vicarious.

The direct effects of timber sale design and size on the ecological integrity of the tribal wilderness will be minimal. The boundary of the tribal wilderness does not follow a definite ecological boundary; thus, ecological changes will occur within the tribal wilderness, since an ecological change on a timber sale site may affect the tribal wilderness within the same ecosystem in many subtle ways. All of the proposed timber sales, however, are at a lower elevation than the tribal wilderness boundary; thus, direct effects such as impacts on water quality from erosion and siltation will not be a problem.

Proximity of the timber sales, contiguous to the tribal wilderness boundary, and the design and size of those sales may temporarily affect current access patterns at trailheads into the tribal wilderness (for two years or more). Some of these impacts could result in permanent changes. Even with adequate road closures following completion of the sales, there will be an increased opportunity for Christmas tree and firewood cutting within the tribal wilderness boundary and a possibility for increased violations of using motorized equipment.

The social effects of sale unit design and size are in relation to tribal wilderness recreation.

The following timber sales are contiguous to the Mission Mountains Tribal Wilderness:

1. Mud Creek (85-86) 85-1.0 MMBF, 86-1.0 MMBF
2. South Crow (87-88) 87-3.0 MMBF, 88-2.0 MMBF
3. Mission (89-90) 89-3.0 MMBF, 90-2.0 MMBF
4. Kelly's Ridge (86-87) 86-6.0 MMBF, 87-6.0 MMBF

The Hellroaring Sale (86-88) is within 1/4 mile of the northern boundary of the Missions.

All of these sales will affect use patterns and visitor perceptions of the tribal wilderness. The immdediate short-term effects may include displacing visitors from existing trailheads for the duration of the timber sale operation. The South Crow Sale (87-88) will impact two of the access points to the Missions. Mud Creek Sale (85-86) will affect another access point. Coordination will be needed between the BIA and the Wildland Recreation Department since sale design and size may affect current trailhead relocation plans. The Mission Mountains Tribal Wilderness Management Plan states that trailheads will be located to avoid problems with private landowners. In addition, all trailheads are to be located outside the tribal wilderness boundary. All of the trailhead relocations mentioned in the tribal wilderness management plan (the Mud Lake, Terrace and Mollman trailheads) are within planned timber sales.

The timber sales will also have short-term direct effects on visitors' sense of solitude, due to sound and visual impacts from a limited area within the tribal wilderness within sight and sound of the timber harvesting activity. Since most visitors camp at lakeshore sites, and will spend only a short time within sight or sound of the timber sales, these short-term effects will be minimal with no significant effects on visitor experience.

The final impact is the vicarious effect of timber sales on the tribal wilderness resource.

Timber sales on the highly visible foothills of the Mission Range may detract from the scenic beauty of the area. Timber management activities which disrupt the vegetation and soil surface have a significant effect on visual quality. Although the impacts of timber management are generally short-termed, the immediate change to the existing landscape is undesirable to many visitors.

Perhaps a more important direct impact is the effect of the timber sales on the substantial vicarious benefits to many tribal members. The overall management goals of the Mission Mountains Tribal Wilderness Management Plan recognize that many tribal members draw spiritual and physical refreshment from simply knowing that the area, and the plants and wild animals it supports, is protected as wilderness (Wildland Recreation Department, 1983). The plan states that "wilderness is, to a segment of the tribal population, vitally important. It is one part of the Indian culture that remains as it was. The need for preservation, then, is more out of reverence for the land, its community of life, and what it means to the Indian culture than out of need to enjoy the benefits of direct use. This is a dimension that is unique to the tribal wilderness and it is reflected in the Council's action." (Wildland Recreation Department, 1983).

The four proposed timber sales contiguous to the Tribal Wilderness boundary could have a direct visual impact on this vicarious appreciation of the tribal wilderness. The timber sales are all located in the broad band of the Douglas-fir and grand fir habitat types, from 3,000-5,000 ft. elevation along the west slope of the Missions. They will be visible from the Flathead Valley, and sale unit design and size will have an important effect on the visibility and appearance of the sales. It will be impossible to screen these sales from view from the valley. For those tribal members with this vicarious appreciation of the Mission Mountains Tribal Wilderness, the visual presence of the sales contiguous to the tribal wilderness will diminish the wilderness resource.

Indirect Impacts: The cumulative effects of increased access resulting from the four timber sales contiguous to the tribal wilderness could change use patterns and result in impacts from recreational use. Existing trailheads will be changed by developments associated with timber sale design and size, and road construction. Recreation opportunities are not eliminated (except perhaps during the actual timber harvesting activity), but are changed.

Many of these changes can be mitigated by working with the Wildland Recreation Office when designing sales. Mitigation possibilities include closure to public use of those roads built to these sale sites. Other possible forms of mitigation will have to be assessed on a sale-by-sale basis. It may not be possible to mitigate all impacts in specific areas.

Since most recreation travel to the Mission Mountains Tribal Wilderness is in an east-west direction, due to the topography, there will be displacement resulting from the timber sales, regardless of the design and size of the sale. Visitors to the tribal wilderness will enter at alternative portals resulting in a changed use pattern, with some drainages receiving much greater amounts of use, while other drainages and lakes will receive little visitation. Even within the two-year period of harvesting planned for each of these sales, resource impacts could cause serious impacts within the tribal wilderness.

Previous studies in the tribal wilderness show that almost all campsites in the area are located on lake shores. Research on areas in the National Wilderness Preservation System since 1973 indicates that light, short-term use produces substantial impacts on wilderness campsites, and further use produces proportionately less ecological impact (Merriam et al. 1973, Cole 1981, Cole 1982, Cole 1983). Redistribution of visitor use due to timber sales will have greater impacts on sites that are currently little used, and lesser impacts on sites receiving the most use.

i. Recreation

Description of the Impacted Environment

The affected environment includes all commercial timberland with recreational value. Essentially, this means recreational settings occurring within forest habitat management types B, C, D, E, and F.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2 - 10 MMBF, with occasional sales to 20 MMBF.

Environmental Consequences

Direct Impacts: Current policy gradually reduces the amount of unroaded recreational opportunities in commercial timberland areas. This trend will be accelerated for sales at the high end of the volume range.

Indirect Impacts: Allowing road access into unroaded areas will permit easier access into nearby unroaded areas. Eliminating unroaded areas may have adverse impacts on big game populations, thus negatively affecting hunting success rates.

j. Archaeology/Cultural Heritage

Description of the Impacted Environment

The impacted environment consists of the entire land area of the Reservation including the Mission Wilderness, Jocko Primitive Area and the Nine Mile Divide.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2 - 10 MMBF, with occasional sales to 20 MMBF.

Environmental Consequences

Direct Impacts: The size of a sale only directly affects archaeological and cultural heritage sites if the sale area includes such a site. The larger a sale area, the greater the potential for inclusion of an archaeological or cultural heritage site. The impact of sale size can be mitigated by reducing the planned size to exclude known sites.

Indirect Impacts: None are anticipated.

k. Human and Community Developments

Description of the Impacted Environment (Sociological Analysis)

The impacted environment includes public and private forest land and those lands adjacent to them. The aesthetic quality of the Flathead Valley is also affected.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2 - 10 MMBF, with occasional sales to 20 MMBF.

Environmental Consequences

Direct Impacts (Sociological Analysis): None are anticipated.

Direct Impacts (Economic Analysis): The direct impacts are generally favorable in terms of income flow from the timber resource. A better sale policy would be for Indian loggers to work on contracts with the tribe and the tribe in turn marketed the logs from landings to highest bidders.

Indirect Impacts (Sociological Analysis): None are anticipated.

Indirect Impacts (Economic Analysis): The indirect impacts associated with higher tribal and Indian incomes are difficult to document, but higher levels of well-being are most often thought of as being distinctly beneficial.

l. Threatened and Endangered Species

Description of the Impacted Environment

All wildlife species that are classified as Threatened and Endangered existing on the Flathead Indian Reservation.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2 - 10 MMBF, with occasional sales to 20 MMBF.

Environmental Consequences

Direct Impacts: One large sale (10 million board feet) will influence the same amount of habitat as two (2 x 5 million board feet) or more smaller sales, provided that the total surface area are the same.

Indirect Impacts: Sales size is less important than insuring that critical areas for threatened and endangered species are protected from destruction and from disturbance during certain times of the year (i.e., nesting season for bald eagles and peregrine falcons).

m. Ecological Interrelationships

Description of the Impacted Environment

All Flathead Indian Reservation lands.

Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2 - 10 MMBF, with occasional sales to 20 MMBF.

Environmental Consequences

The size of any timber sale is dependent on economic conditions and available bidders. The Plan recognizes this. Sale size has important implications to wildlife and regeneration. Large game animals tend to frequent the ecotones between forest and harvested area. In general, the Forest Management Plan is sensitive to sale size problems.

Another side benefit of logging on some habitat types is the production of huckleberries, especially after site preparation with light fires (<300° C. at 5 cm in the soil). Huckleberry production tends to be reduced in open sunlight. Large clearcuts with no shade will produce a smaller berry size. Thus, smaller cutting units might enhance berry production. The possible benefits of using land for berry production to supplement income from timber should not be overlooked. Preliminary estimates suggest that prime berry land (which may not be prime timberland) can produce up to $200/acre/year if well-managed (Stark). Ecologically, there is benefit in having a mosaic of ages of trees on the landscape to offer resistant age classes when epidemics or wildfires occur.

Regardless of the economics of sale size, the individual cutting units should be designed to include stands of similar age, past history, aspect, soils and topographic characteristics. Any number of smaller cutting units with abundant ecotones can be combined into a sale of appropriate size. Ecologically, the design of a sale is probably more important than the size of the sale, provided numerous smaller units are combined into an accessible block for cutting. Some areas with special value such as huckleberries or prime wildlife habitat may need to be set aside in sales of a size to maximize all possible benefits. Sale size that necessitates the construction of an excessive amount of roads is probably more destructive to soils and wildlife than can be justified. For habitat types with chemically or physically fragile soils, the sale size may need to be manipulated to attract contractors who are equipped to log the sites with the least damage.

B. Timber Sale Unit Design and Priority Policy

Background: Present timber sale policy calls for sale units to be designed on an area basis (e.g., valley to divide and drainage to drainage). Therefore, units include a wide range of timber types and stand conditions and require a variety of silvicultural treatments and harvest methods. There are some small, separate sales for specific products (i.e., small logs for studs and houselogs) but, for the most part, this is not the case. Both the BIA and tribes are interested in maximizing economic returns and application of good silvicultural practices.

a. Geology

Description of the Impacted Environment

Commercial timber lands of the Reservation.

Proposed Alternative (No Action Alternative): Timber sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources.

Environmental Consequences

Direct Impacts: There will be no direct impact of sale unit design on the geology, soils or other resources of the reservation. Design criteria relate to the economic/ biologic/engineering conditions for efficient logging. This alternative is most likely to reduce any potential impacts that could result from the actual logging.

Indirect Impacts: No indirect impacts are anticipated. This alternative could best minimize any potential impact from the logging operation itself.

b. Surface Hydrology

Description of the Impacted Environment

The impacted environment includes the commercial timber lands of the reservation.

Proposed Alternative (No Action Alternative): Timber sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources.

Environmental Consequences

Direct Impacts: Hydrologic outputs are scaled on an area basis, e.g.: acre-feet of water yield or tons per square mile/year sediment produced. Watersheds are the bodies which produce these areal yields. Watersheds should be managed on an individual basis, rather than designing the timber sale unit largely on silvicultural needs. Mitigation in terms of sediment yield may be difficult in some sases, if silvicultural needs are the major consideration.

Recognition of equipment requirements (limitations) is extremely important if long-lasting site disturbance is to be avoided. This is fundamental in minimizing degradation of water quality during logging activity. The plan does provide a good review of equipment limitations.

Basing sale units on silvicultural prescription is acceptable if the intent is to maximize sustained yield. However, it should be noted that hydrologic impacts are generally smaller and of shorter duration in uneven-age stand management.

Basing sale units largely on silvicultural needs carries with it a connotation of lack of concern for the environmental consequences in the watersheds affected. The statement that adverse impacts will be mitigated, however, indicates that only those silvicultural practices will be used that will allow mitigation.

It must be kept in mind that watersheds are in a state of dynamic equilibrium. Severe disruption or changes in even small portions of a watershed may bring about undesirable hydrologic changes anywhere in the body.

Indirect Impacts: No significant indirect impacts.

c. Range

Description of the Impacted Environment

Permanent and transitory forest range.

Proposed Alternative (No Action Alternative): Timber sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources.

Environmental Consequences

Direct Impacts: The direct impact of sale unit design will depend on size of cuts, road developments and whether sales are specialized silviculturally. Almost all of the livestock grazing lands will be on areas where track or wheeled tractor skidding is possible. If sale units do not cross sites differing significantly in potential, then the design will have little influence. Where sales are designed on the basis of silvicultural needs, livestock forage on each will be unequal. Some areas will become more heavily grazed than others. This may result in regeneration problems. Roads into areas will increase the accessibility of areas to livestock, thus increasing usable forage but causing possible conflicts with timber and wildlife resources.

Indirect Impacts: Sale unit design may influence forage availability on a permittee's allotment.

d. Soils

Description of the Impacted Environment

The impacted environment includes all commercial forest land on the Flathead Reservation.

Proposed Alternative (No Action Alternative): Timber sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources.

Environmental Consequences

Direct Impacts: The decision to accept or reject this alternative is largely an economic one; direct or indirect impacts of this alternative on the soil resource will be minor as long as the amount of roads constructed is kept to the minimum possible. Roads have a major impact on the soil resource. The soil in the road prism that required thousands of years to form is precipitously mixed, moved and compacted. Ground water flow through the soil is altered and erosion on the cut and fill slopes dramatically accelerated when compared to the undisturbed soil. The road prism will return to a productive site for timber production only after a long period of recovery. The building of a forest road represents an irreversible and irretrievable commitment of the soil to transportation rather than long-range productivity. To the extent that road density must be increased to apply this alternative, long-range productivity will be sacrificed for short-term use.

Indirect Impacts: No cumulative, long-range impacts, other than those noted above, should impinge on the soil as a result of the application of this alternative.

e. Timber and Other Vegetation

Description of the Impacted Environment

All commercial timberlands of the Flathead Indian Reservation.

Proposed Alternative (No Action Alternative): Timber sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources.

Environmental Consequences

Direct Impacts: By following the proposed alternative, silvicultural impacts will be minimized. However, if all timber sale unit designs and priorities are based solely on silvicultural needs, deficit sales may result.

Indirect Impacts: None anticipated.

f. Wildlife

Description of the Impacted Environment

All wildlife species existing on the Flathead Indian Reservation.

Proposed Alternative (No Action Alternative): Timber sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources.

Environmental Consequences

Direct Impacts: The management plan is very ambiguous regarding sale unit design (i.e., no direct comments are made as to which state or to what extent timber sale units will be based on area, logging methods, silvicultural prescription, product, or market conditions). However, these decisions will greatly influence the forest structure and composition, which will, in turn, have a great influence on wildlife species. Decisions of sale unit design and scheduling for the

Reservation will largely determine the kinds of habitats available, and consequently, the numbers and distribution of various wildlife species. In general, if managers adequately maintain an interspersion of the different successional stages of all habitat types (i.e., maintain habitat diversity), then a full complement of wildlife species can be maintained also.

Indirect Impacts: No significant indirect impacts.

g. Fisheries

Description of the Impacted Environment

All commercially available forest lands and associated aquatic habitats within the reservation. Present policy is to design sales on an area basis. While this may be a convenient option, it does not address the variable habitat types within an area.

Proposed Alternative (No Action Alternative): Timber sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources.

Environmental Consequences

Direct Impacts: Impact will be mediated through size of cuts and pre-cut development (e.g., road construction). Both water yield and sedimentation will be positively correlated with the cut area. Impacts may be related to habitat type as mentioned under Fire Suppression Policy. This alternative appears to be the least disruptive, but attention should be given to particularly vulnerable areas. Again, a policy of riparian zone protection is suggested.

Indirect Impacts: Long-term damage may result from cuts of areas of low site quality.

h. Wilderness

(Note: Because sale unit design and sale size have a greater impact on the tribal wilderness resource than the management concerns, and since they are related in their effects, analysis for these two management concerns has been combined.) See part II.A.h of this document.

i. Recreation

Description of the Impacted Environment

The affected environment includes all commercial timberland with recreational value. The current policy with respect to sale design is to use a variety of harvesting methods and silvicultural prescriptions within one area.

Proposed Alternative (No Action Alternative): Timber sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources.

Environmental Consequences

Direct Impacts: Harvesting of timber from lands having recreational value may significantly change biophysical aspects of the setting and access to and within it. The current policy, over time, changes unroaded primitive or semiprimitive settings to semiprimitive motorized or roaded natural settings depending on the intensity of the harvest, the silvicultural prescription, and amount of road construction. Road access policy following completion of the harvest may also change the nature of the recreational setting.

Indirect Impacts: Changes in the biophysical setting may affect visitors' experiences. Additional road access may result in increased demand on nearby unroaded areas.

j. Archaeology/Cultural Heritage

Description of the Impacted Environment

The impacted environment consists of the entire land area of the reservation including the Mission Wilderness, Jocko Primitive Area and the Nine Mile Divide.

Proposed Alternative (No Action Alternative): Timber sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources.

Environmental Consequences

Direct Impacts: All timber sale areas have the potential ot including archaeological and cultural heritage sites. As discussed in other sections, any surface disturbances (logging, roading, slash disposal, etc.) which occur on such sites can alter or destroy the archaeological and cutlural values. All timber sale designs should take into account the protection of these sites.

Indirect Impacts: When roads are built into isolated areas having sites of archaeological and cultural heritage, the potential is increased for people to visit these areas and discover such sites. Indirect impacts can be minimized by closing these roads to public travel.

k. Human and Community Developments

Description of the Impacted Environment

Social ecology of the forest and reservation. Economic viability of timber harvesting.

Proposed Alternative (No Action Alternative): Timber sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources.

Environmental Consequences (Sociological Analysis)

Social factors should take precedent over growth and entry variables regarding timber sale design and priority. They should be primary factors instead of secondary ones. Until recently, the Tribal Council has made decisions that show maximizing economic returns is first priority for the timber lands.

Section III.E.B.c. lists five market factors. None includes cost-benefit analysis for the entire Forest Management System including reforestation and maintenance. Such an analysis may not be possible. However, if the Tribes are to use "sound economic principles" in their sales decisions, costs and benefits should be considered in arriving at minimum bid figures. As the economics of harvesting prove too expensive for bidders, given this minimum bid price, and as employment opportunities for tribal members are scarce, the tribes might consider sales of harvested and recovered timber at the bidder's plant or yard as an alternative. Regardless, the costs and benefits to the tribes should be carefully inventoried and each considered prior to the establishment of a minimum bid price or timber sale. The inventory of costs and benefits should include social variables as well as economic ones.

Direct Impacts (Sociological Analysis): None are anticipated.

Indirect Impacts (Sociological Analysis): These include loss of attractiveness of the reservation and region aesthetically and for tourism, and reduction of regional economic and social potential.

Environmental Consequences (Economic Analysis)

If specialty sales are concentrated in the small sales, there is a potential for increasing tribal income. Trying large specialty sales will generally be less advantageous unless there are large homogeneous stands (if lodgepole pine).

The plan could improve the delivery of silvicultural systems on a more site specific basis. Specialty sales are also likely to be more easily administered due to less contract variability.

Direct Impacts (Economic Analysis): No adverse economic impacts are anticipated.

Indirect Impacts (Economic Analysis): None are anticipated.

1. Threatened and Endangered Species

Description of the Impacted Environment

All threatened and endangered species existing on the Flathead Indian Reservation. These are discussed in the Physical and Biological Setting section of this report.

Proposed Alternative (No Action Alternative): Timber sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources.

Environmental Consequences

Direct Impacts: Sale unit designs that stress silvicultural needs may have adverse influences on wildlife habitat structure and composition, so that threatened and endangered species may be directly influenced. Since this Proposed Alternative states that adverse impacts will be mitigated, there may not be a problem. Generally, managers should protect these species from human disturbance through timing of sales. It is especially important to prevent human activities near bald eagle roosting and nesting areas when the bald eagles are using these areas, and areas near cliffs where peregrine falcons might nest. Unit designs can influence grizzly bear food production in either a positive or negative way, depending upon the forest habitat type, existing understory vegetation, and site preparation.

Indirect Impacts: Human activity on sale areas after logging will be influenced by the sale design (especially by unit size, roading, etc.). This may have a significant influence on habitat effectiveness for threatened and endangered species. Human activities can be controlled by regulating post-logging access.

m. Ecological Interrelationships

Description of the Impacted Environment

All Flathead Indian Reservation lands.

Proposed Alternative (No Action Alternative): Timber sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources.

Environmental Consequences

Sale design is influenced by a variety of factors: age, uniformity, topography, elevational range, soil type, past history, the vigor of the stand, accessibility, and disease and insect problems, to name a few. Of considerable importance is the steepness of the land and accessibility, which often determine what type of equipment can be used. Design may be influenced by the existence of a road and the cost of building another road to access the same area. Roads should be well-designed and permanent so that the same roads can be used for future entries.

The ecological aspects of stand design deal with natural regeneration success, wildlife, and the importance of ecotonal areas. Animals become accustomed to roads after time, but new roads may pose an unnecessary distraction to wildlife. Design can capitalize on natural fire breaks in areas of high fire susceptibility. The plan addresses the need to examine the location of disease and insect centers in designing timber sales. Sale design on prime huckleberry land can incorporate a small amount of shade (<30%) to encourage berry production, if that is an acceptable objective.

The plan appears to be based on ecologically sound concepts of sale design. Economic constraints are often of over-riding concern in sale design, but a single cutting unit that has two forest habitat types or two distinctly different soils can produce ecological problems when treated as one unit.

III. Silvicultural Program

A. Christmas Tree Cutting Policy

Background: Christmas tree harvest is a very political issue on the Flathead Reservation because many tribal members economically benefit. On the average, over 300 harvest permits are issued and 200,000+ trees are harvested annually. Because the issue is politically sensitive, B. I. A. and tribal efforts to control Christmas tree harvest in the past have been nearly ineffective, and forest resource damage has been done. "Leave trees" in thinned areas have been harvested, and there hasn't been adequate control over cut tree or area selection, which has resulted in disgenic tree harvest practices and, quite often, stocking problems.

a. Geology

Description of the Impacted Environment

The affected environment consists of the entire land area of the Reservation where Christmas trees grow and where Tribal members are allowed to harvest the trees.

Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

Environmental Consequences

Direct Impacts: None are expected.

Indirect Impacts: None are expected.

b. Surface Hydrology

Description of the Impacted Environment

The impacted environment consists of the entire land area of the

Reservation including the Nine Mile Divide. No Christmas tree harvesting is allowed in the wilderness areas.

Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

Environmental Consequences

Direct Impacts: The major hydrologic consequence of unrestricted Christmas tree cutting is that it prolongs, often indefinitely, the hydrologic recovery of a site which has been harvested. The present policy of largely unrestricted Christmas tree harvest is not in the best environmental interest. Control of Christmas tree harvest by a combination of management and regulation would help minimize the impacts of delayed hydrologic recovery.

The combination of tree stand improvement and Christmas tree harvest is recommended, rather than unregulated harvest. Overstocked stands can be thinned without increasing or appreciably setting back hydrologic recovery.

Establishing accessible Christmas tree production areas is a sound idea. It commits certain areas to permanent hydrologic disturbance, but accessibility implies lower elevation sites which probably don't exhibit much greater water yield than in their undisturbed state.

Indirect Impacts: None are anticipated.

c. Range

Description of the Impacted Environment

All lands having a range potential on the Flathead Indian Reservation.

Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

Environmental Consequences

Direct Impacts: No significant direct impacts.

Indirect Impacts: Past indiscriminant harvest of Christmas trees could lead to a small increase in livestock forage by causing a thinning effect. However, it seems unlikely that Christmas tree harvest would have a large influence on range.

d. Soils

Description of the Impacted Environment

The affected environment includes all forest land on the reservation with the exception of the tribal Mission Mountains Wilderness and Jocko Primitive Area. Other forested areas which are not easily accessible may also be excepted. Since the current policy permits Christmas tree cutting in a virtually unregulated manner, any forested area with small trees on it is susceptible to harvest.

Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

Environmental Consequences

Direct Impacts: It is obvious that the present policy of "largely unregulated ... harvest" cannot be continued without serious adverse impact on the forest resources and on the economic well-being of many tribal members. But the resource impacts are on the future growing stock and regeneration, rather than on the soil. Harvesting young trees removes soil nutrients, but they have been removed by fires through the millenia, and still trees occupy the site. Often, the best Douglas-fir growing sites for Christmas trees are the drier fir sites because internode length is less. These are the very sites that have burned the most frequently. Thus, the harvesting for Christmas trees probably has minimal adverse impacts on the soil resource. Long-range productivity is not being sacrificed for short-term use.

Wild harvest of Christmas trees on a permissive basis is not compatible with good soil management. The Christmas tree industry is extremely important to the welfare of the Indian people and must be maintained. One practice that would be compatible with good soil management would be to select certain soils where the three primary commercial Christmas tree species show a suitable growth form and designate these as areas where controlled harvest is possible. Such areas would be withdrawn from commercial timber production. By nature, a Christmas tree should be an open-grown sapling or seedling that has grown slowly. Soils that support this type of slow growth are poorly suited to commercial timber production. Most of the shallow soils

($<$20-24 inches deep) will grow saplings well, but timber growth is poor once the stand begins to close and the root zone is heavily impregnated with roots. Deep sandy soils (Group 1), gravelly soils (Group 4), acid soils (some of Group 23, Tables 14 and 15) and some soils with low nutrients (Group 25) may be suitable for Christmas trees but poorly suited to the growth of mature timber.

Indirect Impacts: Since Christmas trees would normally be harvested within 10-15 years, and since the entire tree would be removed, nutrient losses would be considerable with each harvest. Young trees are particularly high in phosphorus (Stark 1983a). Whole-tree removal is estimated to take away 36-50% of available ecosystem phosphorus for 10-foot trees (Stark 1983a). Losses would be greater (up to 80%) on poorer sites. Nitrogen losses are also large with Christmas trees (12-36% of immediately available N^2). Calcium losses per acre of Christmas trees range from 3-10% and potassium losses 6-16%. Since nitrogen is fixed microbially, large amounts (>20 tons/acre) of large cull boles (>12 inches in diameter) should be left on site when the original forest is cleared for Christmas tree harvest. These logs will provide habitat for mycorrhizae and nitrogen fixing organisms for about 120-150 years. During that time, additional large logs will need to be added after the Christmas trees are harvested to maintain a healthy condition for saplings. Cull logs can be used, but fertilizer may harm mycorrhizae. See the Ecology section for further recommendations. Fertilizer at low levels may be needed as a mitigation measure for tree growth.

In addition, long-range cumulative impacts on the physical properties of the soil resource will be minimal.

e. Timber and Other Vegetation

Description of the Impacted Environment

All Reservation lands which are subject to the unregulated harvest of Christmas trees, especially those lands which have value for timber and areas having regeneration problems.

Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

Environmental Consequences

Direct and Indirect Impacts: Silvicultural control of stand development density, spacing, species mix, and age class structure is not possible if uneducated, unregulated Christmas tree cutting is allowed.

Stands that need thinning frequently have trees of low crown ratio, which are not desirable for Christmas trees.

Species preferences for Christmas trees may reduce stand species diversity.

Branch turn-up often results from careless Christmas tree cutting, resulting in deformed stems and no thinning.

Realistically, most Christmas trees cut are viable commercial timber trees whose future value is lost when the tree is removed when 6-8 feet tall.

Also, the Christmas trees which are cut are genetically best, leaving inferior genetic stock on site.

Dedicated land to Christmas tree farming only would minimize these impacts.

f. Wildlife

Description of the Impacted Environment

All forms of wildlife, especially big game species, which would inhabit lands having the potential for Christmas tree cutting.

Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

Environmental Consequences

Direct Impacts: The random but fairly constant presence of Christmas tree cutters may cause temporary displacement of wild ungulates on fall ranges and may lead to increased harvest of these ungulates by chance encounters.

Indirect Impacts: Trees (especially Douglas-fir) sometimes invade grasslands at lower timberline that may be used as winter foraging areas by elk. Removal of these small trees for Christmas trees will help maintain important winter forage. It may also be possible to extend the use of seral browse winter ranges by removing trees before they "shade out" the browse plants.

g. Fisheries

Description of the Impacted Environment

All available forest lands within the reservation.

Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

Environmental Consequences

Direct Impacts: None will occur except where policy detracts from sound management practices. This may occur when extensive harvest is permitted in a thinned or planted area.

Indirect Impacts: None except as noted above.

h. Wilderness

Description of the Impacted Environment

Approximately 200,000 Christmas trees are harvested annually. Indiscriminate harvest in the past has greatly reduced the area where good Christmas trees can be found. Much of the tree harvest occurs in the Douglas-fir zone (3,000-5,000 feet in elevation) where most of the tribal wilderness trailheads are located. Most of this harvest occurs close to existing roads.

Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

Environmental Consequences

Direct Impacts: Christmas tree cutting might occur within the Mission Mountains Wilderness (although this is not allowed) and could result in some resource impact in limited areas within the wilderness. Those in charge of future efforts to develop a diversified Christmas tree harvest and market programs should consult with the Tribal Recreation Office to mitigate any impacts on the tribal wilderness resource. Otherwise, no impacts would occur.

Indirect Impacts: Coordination with the Tribal Recreation Office and the development of a planned Christmas tree harvesting program, rather than the current indiscriminate harvest, should prevent cumulative impacts from developing in the future.

i. Recreation

Description of the Impacted Environment

The affected environment includes all land with recreational value where wild Christmas trees may grow. Apparently, areas excepted from this are limited to the tribal Mission Mountains Wilderness and Jocko Primitive Area. Other forested areas which are not easily accessible may also not be impacted by the current policy. Since the current policy permits Christmas tree cutting in a virtually unregulated manner, any forested area with small trees on it is susceptible to harvest.

Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

Environmental Consequences

Direct Impacts: Continuing the present policy of unregulated Christmas tree cutting could potentially result in severe negative impacts to certain recreational settings. Intensive removal of small trees in recreational settings could substantially change the nature of that setting. Since there is no inventory of recreational setting opportunities in forested areas of the Reservation, and no inventory of small tree areas with the potential of growing Christmas trees, the magnitude of this impact is not known.

Indirect Impacts: The unregulated harvest of Christmas trees allows for the eventual removal of whole age classes of trees, eventually reducing the amount of forested recreational settings.

j. Archaeology/Cultural Heritage

Description of the Impacted Environment

The affected environment includes the entire land area of the Reservation including the Mission Wilderness, Jocko Primitive Area and the Nine Mile Divide. Impacts will vary depending on the nearness of the Christmas tree cutting areas to sites of archaeological value and cultural heritage.

Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

Environmental Consequences

Direct Impacts: None are anticipated.

Indirect Impacts: Any indirect impacts are anticipated to be those which bring people into direct contact with sites of archaeological importance and cultural heritage. If Christmas tree cutting is directed away from these sites, there will be fewer opportunities for people to discover and damage these sites.

k. Human and Community Developments

Description of the Impacted Environment (Economic Analysis)

Financial well-being of the tribe and tribal members.

Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

Environmental Consequences (Economic Analysis)

Direct Impacts (Economic Analysis): Christmas tree cutting is an activity providing income for Tribal members. Thus, the draft plan recognizes a potential conflict between immediate income to tribal members and long-term income from saw timber stands. Currently, there is no charge to individual tribal members for Christmas tree permits. There is a conflict between members of the tribe regarding the allocation of these permits. Consideration should be given to establishing a tribal enterprise which buys trees from tribal members and markets them on behalf of the tribe. The potential of large scale contracts for trees and superior market knowledge would allow a tribal return from Christmas tree cutting where it currently doesn't exist, as well as reduce a conflict between tribal members. It may also be another source of tribal employment, as the tribe would replace other middlemen.

Indirect Impacts (Economic Analysis): There is inevitable social disharmony under the current policy with the tribe.

Discussion and Environmental Consequences (Sociological Analysis)

Item 16 of the Objectives and Goals proposes that the "Christmas tree harvest and marketing program" be developed "for the Tribes (sic) perusal". Tribal leaders should be included as major participants in program development, evaluation and implementation, regardless of the segment of the management or management planning affected.

Direct Impacts (Sociological Analysis): No adverse sociological impacts are anticipated.

Indirect Impacts (Sociological Analysis): No adverse sociological impacts are anticipated.

1. Threatened and Endangered Species

Description of the Impacted Environment

Wildlife considered to be threatened or endangered which exist on the Flathead Indian Reservation.

Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

Environmental Consequences

Direct Impacts: Presence of Christmas tree cutters may cause displacement of threatened and endangered species. The displacement would probably be temporary.

Indirect Impacts: Tree cutters may carry guns and shoot at "varmints", which may be rare or considered endangered species. Also, illegal taking of eagles and bears for feathers and claws (proven to be for religious purposes) could result.

m. Ecological Interrelationships

Description of the Impacted Environment

The impacted areas are all areas now used for wild Christmas tree harvest and any that might be used in the future.

Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

Environmental Consequences

Direct Impacts: On those sites where most or all of the trees are suitable for Christmas trees, the potential exists for almost complete removal of the tree cover through tree harvesting. This would have the effect of clearcutting the area, leaving the soil unprotected. Watershed quality could be harmed. Also, potential Christmas tree cutting sites may occur on unstable soils and steeper slopes on which any harvest would cause soil erosion. The proposed alternative is not recommended. Rather, harvest sites should be identified that would not lead to site damage. Suitable habitat types for Christmas tree culture may be Groups B, D, E, F, and in some cases, G (Table 13). Suitable sites cannot be selected on the basis of habitat types alone, but must be located by soil series and demonstrated open-grown tree performance.

Indirect Impacts: This system would remove Christmas tree harvest from the forest at large so that a more effective means of timber stand improvement needs to be found. Christmas tree harvest normally does not remove from a wild stand those trees that need to be harvested.

B. Precommercial Thinning Treatment Policy

Background: The BIA contends that current policy and guidelines are not flexible enough to maximize the benefit/cost outcome of the Flathead thinning program. The tribes have banned dozer thinning, thinning guidelines prevent removing trees over five inches diameter at breast height (dbh) except for culls or diseased trees, and a 15 ft x 15 ft leave tree spacing requirement is required over the entire range of sites thinned. It is considered that the foregoing requirements often preclude thinning to optimum, site specific stocking levels and therefore detract from the cost effectiveness of the timber stand improvement program.

a. Geology

Description of the Impacted Environment

Environmental conditions of sites selected for precommercial thinning should not change in environmental character provided treatments are in keeping with the site conditions. The proper treatment selection must keep in mind slope, aspect, cover, moisture, and other parameters that affect the stability of the site, as well as the economics of treatment.

Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Environmental Consequences

Direct Impacts: Erosion rates and water quality parameters can be affected if attention to environmental factors is slight in selecting treatment methods to enhance optimum economic production. Care must be taken to consider treatments that maintain site quality as well as enhance economic return.

Indirect Impacts: Same as direct impacts.

b. Surface Hydrology

Description of the Impacted Environment

The impacted environment consists of the entire land area of the Reservation and Nine Mile Divide except for the Mission Mountains Wilderness and Jocko Primitive Area. Impacts will differ according to past thinning of the vegetation, past and present cultural resources, and past and present cutting and slash disposal practices.

Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Environmental Consequences

Direct Impacts: There is little hydrologic consequence of thinning sapling or pole-aged stands. Hydrologic utilization is nearly complete on all sites by this age. Any water yield increases obtained by thinning to a 15 ft x 15 ft spacing are quickly recovered by growth of the remaining overstory and understory vegetation.

If all constraints on treatment methodology are removed, then dozer thinning is a potential method. Dozer thinning will, of course, be limited to gentle terrain. On those gentle slopes, even moderate site disturbance will not produce significant amounts of sediment to degrade water quality.

Indirect Impacts: The management plan recognizes the potential problem of fuel buildup and slash disposal. These hydrologic implications have already been discussed in the Fire Suppression Policy section.

c. Range

Description of the Impacted Environment

Precommercial thinning will influence the range resource on all commercial forest lands.

Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Environmental Consequences

Direct Impacts: The commercial thinning could have beneficial or detrimental effects, depending on slash disposal and undergrowth treatment. In sites where the slash is not disposed of, the slash will form mechanical barriers to livestock and wildlife attempting to graze there. Mitigation would involve slash removal. Thinning methods which increase ground disturbance will also increase the growth of forage for ungulates. It is anticipated that on thinned areas where slash is disposed of, the amount and nutritional quality of the forage would increase.

Indirect Impacts: The amount of canopy cover and major overstory species remaining after thinning will influence the understory. Several studies have shown that there is a very significant reduction in forage production as canopy cover increases above 30%. Thus, reduction of the forest canopy allows more sunlight to reach the understory.

d. Soils

Description of the Impacted Environment

This management concern impacts all commercial timberlands, essentially forest habitat management groups B, C, D, E and F.

Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Environmental Consequences

Direct Impacts: Treatment priorities, site selection and stocking levels should be based upon site quality since the best sites will yield the greatest economic return from thinning, and the optimum stocking levels vary with site quality. The impact of these considerations on soil will be minimal. There may be some concern of treatment influence on soil, especially regarding dozer and herbicide thinning that are possible treatments if all constraints are lifted on treatment methodology. Any use of equipment compacts the soil surface and disturbs some of the organic horizon. This causes reduced infiltration and increases the opportunity for erosion. However, stands thinned with dozers are usually stagnated and have very high densities; frequently they have "dog-hair" tree stands. When the stems are pushed over, they form a mat that protects the soil.

Herbicides not only kill the target organisms, but they may affect the population of soil organisms. Major concern is not with the heterotropic micro-organisms that oxidize soil organic producing humus because the numbers of organisms performing this reaction is so large. Rather, the major interest is on the influence of herbicides on nitrifying bacteria because there are so few genera of micro-organisms involved. However, under the rates of herbicides normally used, the damage should be minimal.

Indirect Impacts: No long-range cumulative impacts are anticipated.

e. Timber and Other Vegetation

Description of the Impacted Environment

This management concern impacts all commercial timberlands on the Reservation.

Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Environmental Consequences

Direct Impacts: Favoring sapling over pole stands precludes the opportunity to thin a stand with a financial return less than 20 years away.

A 15 ft x 15 ft spacing is often greater than optimum, especially for small-crowned species like lodgepole pine.

The proposed guidelines, if implemented correctly, are a significant improvement over present "cookbook" rules, and they maximize logical silvicultural management.

f. Wildlife

Description of the Impacted Environment

All wildlife, especially big game, existing on the Reservation.

Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Environmental Consequences

Direct Impacts: Dense stands near winter foraging areas are favored bedding sites for big game. Thinning of these stands will be detrimental to big game. Since the Forest Management Plan states that a wildlife plan is worked out for each thinned area, it can be assumed that problems with bedding sites will be prevented.

Dense "doghair" sapling stands on summer ranges are avoided by big game animals, so that thinning of such areas may result in increased big game (deer and elk) use. More intense thinning (>70%) may prolong the forage production phase of some stands on both summer and winter ranges. However, big game use is greatly reduced on areas where their movements are inhibited by slash. Average slash depths should be reduced to less than 1.5 feet. Moderately thinned sapling stands may simply reduce the density of hiding cover.

Indirect Impacts: It is difficult to predict specific effects of thinning because of the large number of site conditions one might encounter in the field.

The indication in the management plan that wildlife personnel will be consulted for recommendations on areas where thinning is planned is commendable.

g. Fisheries

Description of the Impacted Environment

All commercially available forest lands within the reservation.

Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Environmental Consequences

Direct Impacts: Timber stand improvement through precommercial thinning would have little direct impact on fisheries except when they might call for extensive road building or herbicide use.

Indirect Impacts: No significant impacts.

h. Wilderness

Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Environmental Consequences

Direct Impacts: There are no foreseeable impacts resulting from this management concern.

Indirect Impacts: There are none foreseeable.

i. Recreation

Description of the Impacted Environment

The affected environment includes all commercial timberland with recreational value. This means recreational settings in habitat groups B, C, D, E, and F.

Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Environmental Consequences

Direct Impacts: Removal of all thinning treatment constraints such as dozer thinning may lead to adverse visual impacts in some cases. Adverse impacts could be mitigated by removal and acceptable disposal of slash.

The current policy of providing for thinning may enhance the visual attractivemess of some stands as long as slash is properly removed or disposed of. If thinning requires construction of new roads, the additional access may change the nature of the recreational setting or may increase the demand for adjacent unroaded areas.

Indirect Impacts: The proposed policy should not have indirect effects significantly different from the current policy.

j. Archaeology/Cultural Heritage

Description of the Impacted Environment

The affected environment includes all commercial timberlands on the Reservation where sites of archaeological or cultural heritage importance may occur.

Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Environmental Consequences

Direct Impacts: Serious direct damage may occur to the archaeology/cultural heritage because of mechanical activity in thinning forest stands. The areas to be thinned should be searched for archaeology/cultural heritage sites before any mechanical disturbance occurs. When present, these sites should be protected at all costs.

Indirect Impacts: Any indirect impacts are anticipated to be those which bring people into contact with remote areas where sites of archaeological/cultural heritage importance may occur. This is especially true of those persons working on the thinning operation who would be tempted to pick up artifacts on the surface.

k. Human and Community Developments

Description of the Impacted Environment

Economic and social well-being of the tribe, tribal members and related em- ployment.

Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Environmental Consequences

Direct Impacts: The preferred policy implies considerable employment opportunities for tribal members in thinning contract work. The plan does not directly address the return on investment from thinning. This is a potential direct impact since one funding source is Purchaser Timber Stand Employment payments which reduce stumpage receipts. In general, concentrating on the best sites and emphasizing residual tree quality are policies which provide the best returns on precommercial thinnings. The return to thinning is typically the result of producing larger diameter crop trees rather than volume increases.

Indirect Impacts: Indian employment will likely be maintained as reforestation backlog work is replaced by pre- commercial thinning work.

l. Threatened and Endangered Species

Description of the Impacted Environment

All wildlife species classified as threatened and endangered and existing on the Reservation.

Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Environmental Consequences

Direct Impacts: There is expected to be no significant impact, but thinning crews may temporarily displace threatened and endangered species.

Indirect Impacts: Cover for grizzly bears may be reduced, increasing the possibility of bear-human encounters. Thinned areas may be avoided by grizzly bears or wolves if slash cover and depth hinder their movements.

m. Ecological Interrelationships

Description of the Impacted Environment

The plan presents evidence of a well-organized approach to precommercial thinning and pest control. There is never enough money or manpower to do all that should be ideally done, but the plan shows willingness to use computer assistance and modeling to aid in timber management. Stand exam procedures appear to be adequate to meet ecological needs, although as with all stand exams, soils and wildlife are considered to be less important than the condition of the stand itself.

Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Environmental Consequences

Direct Impacts: From an ecological point of view, thinning is best performed in the young stand before any heavy equipment is needed. Trees that begin growth with the proper spacing by about 20 years of age are more likely to grow well throughout their lives than those that begin early growth with severe competition. The spacing factor is somewhat influenced by species. Trees such as lodgepole pine may continue to reseed the area if they are thinned too early. Some overstory and a dense understory are valuable at thinning time to prevent the establishment of new seedlings. An open stand that is not too dense is more resistant to diseases and insects and more valuable to wildlife and for berry production needed by wildlife and man. The tree selection criteria for thinning appear to be sound, although a few old relict individuals should be left for bird habitat.

The plan mentions removal of all unmerchantable stems that are infected. This is reasonable, but in a stand with multiple ages, old individuals that are of merchantable size may need to be removed to eliminate the source of seeds.

The possibility exists for combining precommercial thinning with the production of non-splitable firewood as a source of income. This source of firewood is currently made available to the public; however, the costs and effort are not sufficiently favorable to induce much public use at the present time.

Precommercial thinning creates one problem: slash. It normally cannot and should not be burned unless it presents a severe fire hazard. At the same time, deep slash can dry slowly, encouraging build-up of *Ips* populations. This problem presents a good argument for thinning early in the life of the stand to maximize growth potential, minimize the amount of nutrients tied up in biomass that will never be merchantable, and reduce the chances of beetle epidemic.

Thinning provides work for people and can create healthy ecosystems. In general, the fewer entries into the stand, the better. One exception is on very thin soils (12-15 inches of loams over compacted tills, as an example). These areas are often susceptible to windthrow in the mid to late years. If dense western larch or lodgepole pine are thinned in operation, extensive windthrow may occur, creating poor wildlife habitat and a fire hazard. Such stands can be entered for a light initial thinning, and then re-entered in 5-10 years after the root systems have expanded to achieve the desired stocking.

C. Even-Aged Block Size Policy

Background: Under the present forest management plan, the tribe has constrained clearcuts and seed tree units to a maximum size of eight acres. Shelterwood units have been constrained to a maximum size of 15 acres. There have been some departures from these constraints over the past decade, but for the most part, the size standards have been observed. The size limits have hurt efforts to apply the best silviculture possible (e.g., mistletoe control in eight acre blocks is ineffective) and have added a very heavy technical and administrative workload to both presales and sale administration. The Bureau of Indian Affairs feels that more flexibility in even-aged management is necessary, and that relaxing cutting unit block size constraints will provide the needed flexibility.

a. Geology

Description of the Impacted Environment

The impacted environment consists of the entire land area of the Reservation subject to logging.

Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

Environmental Consequences

Direct Impacts: Increasing the size of shelterwood and clearcut/seed tree block size can significantly increase the rate and cumulative impact of soil erosion, unless site selection is carefully planned, numbers of cutting units are reduced, and harvesting methods are closely monitored. The steep slopes, thin soils, and higher precipitation areas of the Reservation are especially vulnerable.

The direct impacts on specific sites are increased erosion, degraded water quality, higher suspended and dissolved load in the stream(s) draining the affected watershed, and less chance for successful regeneration because of soil and nutrient loss after cutting. Soil and nutrient loss are immediate and irreversible in the near term (0-100 years) unless rapid revegetation occurs.

Indirect Impacts: If the same number of clearcut and shelterwood units is retained while increasing the size of the units, there can be a devastating long-term cumulative effect on the reservation. Water quality degradation in the entire drainage system of the Reservation is possible, affecting fishing, recreation and other potential uses; harvest cycles can be interrupted and certain sites lost unless care is taken and each evaluated separately in terms of applying the best logging system and fuels treatment. Total treated acres should not be increased. Soil erosion constitutes a severe cumulative impact on good growing sites and, unless mitigated through planning and regeneration practices, can seriously degrade potential sites. Soil formation on bedrock (Beltian) units is slow (millions of years), somewhat faster on Tertiary and Pleistocene units and, depending on site, relatively fastest on recent stream deposits. Inasmuch as these units separate mountain and slope areas, valley bottoms and near stream regions, respectively, the best commercial tree sites will be most impacted by changes in erosion rates.

b. Surface Hydrology

Description of the Impacted Environment

The impacted environment consists of the entire land area of the Reservation including the Mission Wilderness, Jocko Primitive Area and the Nine Mile Divide.

Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

Environmental Consequences

Direct Impacts: Principal hydrologic consequences were discussed in Sale Unit Design and Sale Size sections.

It should be remembered that the total hydrologic impacts on a watershed are a function of the size of harvest blocks, the silvicultural prescription in the blocks, and the percentage of the total watershed impacted. The magnitude of the impacts is directly related to the amount of surplus precipitation available for runoff. The duration of the impacts is determined by site productivity or the rate of vegetative regrowth.

Indirect Impacts: No significant impacts.

c. Range

Description of the Impacted Environment

Even-aged block size will influence the range resource considered as transitory range and wildlife habitat.

Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

Environmental Consequences

Direct Impacts: Even-age management will increase livestock range by increasing transitory range. Clearcuts averaging 10-15 acres in forest habitat groups B, C, and D have the potential to significantly increase livestock forage where slopes are not too great (<50%). Although the group D lands are of minor importance to livestock, clearcuts would increase the forage production of these sites. Clearcuts are the major areas suitable for livestock grazing within the spruce-fir forest.

Forage production for livestock in western Montana can be expected to increase to a peak from a few years to perhaps 20-30 years after logging. Grass and forb production would peak earlier than shrub production. The use of even-age management to replicate the role of fire and revert infected (mistletoe or insects), decadent stands to productive stands with seral tree species will increase livestock forage quality and quantity.

Other factors being equal, selectively logged areas will be more readily accepted by elk than clearcuts. Elk normally do not prefer to graze further than 150-200 yards into a clearcut while cover is sparse. When old-growth timber and cover remain in close proximity, the adverse impacts should be small.

Indirect Impacts: Even-aged block size will indirectly influence the range by influencing the carrying capacity of a permittee's allotment. In order to stabilize animal numbers (carrying capacity), a permittee's allotment should receive even-aged management or thinning to maintain a desired carrying capacity.

d. Soils

Description of the Impacted Environment

The impacted environment includes areas of commercial forest land on the Reservation dedicated to even-aged management and temporary even-aged management stands. The former consists more specifically of forest habitat groups E and F and selected stands of pure lodgepole pine. The latter includes specific stands in forest habitat groups B, C, and D where control of dwarf mistletoe is of primary importance.

Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

Environmental Consequences

Direct Impacts: As long as precautions are taken against erosion or compaction damage at the time of entry, cutting unit size should not harm most forest soils. However, droughty soils or chemically fragile soils may be damaged with any management procedures.

Indirect Impacts: No significant impacts.

e. Timber and Other Vegetation

Description of the Impacted Environment

All commercial timberlands of the Flathead Indian Reservation.

Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

Environmental Consequences

Direct Impacts: Large clearcuts are only undesirable silviculturally if seedling establishment problems result. Growth of several species (for example Douglas-fir and larch) being managed for are promoted by large clearcuts; in fact, overstocking will result on small clearcuts.

Stands should be chosen on sites that will not experience severe microsites for seedlings. Other problems may be edge windthrown trees and the lack of age class diversity that can, in the long-run, result in insect-disease problems (pine beetle).

Cost and management efficiency of site preparation, logging engineering, planting, etc. are all optimized by increasing even-aged block size.

However, if reliance is on natural seeding, increasing the size of a clearcut may result in lower seedling density in the center due to insufficient seed distribution.

Smaller block sizes also tend to increase big game use in contrast to larger block sizes, concentrating seedling damage.

Indirect Impacts: No significant impacts.

f. Wildlife

Description of the Impacted Environment

All forms of wildlife, especially big game, which would inhabit lands having the potential for even-aged cuts or areas that access roads would have to cross.

Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

Environmental Consequences

Direct Impacts: Table III-8 of the Management Plan indicate that even-aged cuts will range from 3-20 acres (average 10-15 acres).

Generally, the small, even-aged block sizes proposed in the Management Plan will be favorable for wildlife, assuming that the blocks are allowed to recover to the sapling stage before another block is cut adjacent to the first. Over time, this should produce well interspersed blocks in various seral stages and habitat types. This would be a diverse habitat for wildlife, with an abundance of edge.

Indirect Impacts: More roads are often required to access many small logging blocks than fewer large ones. Many wildlife species tend to avoid human activities along forest roads. Therefore, in areas where roads remain open to human access, habitat effectiveness may be reduced for some distance adjacent to the roads, even though the habitat is otherwise acceptable. This problem can be mitigated by road closures.

g. Fisheries

Description of the Impacted Environment

All commercially available lands within the reservation.

Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

Environmental Consequences

Direct Impacts: Clearcut size can potentially have an impact on water yield. However, clearcuts of 10-20 acres should have minimal impact.

Indirect Impacts: None are anticipated.

h. Wilderness

Description of the Impacted Environment

Tribal wilderness lands.

Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

Environmental Consequences

Direct Impacts: There are no specific impacts to tribal wilderness lands identified from this management concern since timber harvesting is not permitted within the Mission Mountains Wilderness. Even-aged block size may affect visual qualities. See management concern 2.0. for a detailed description of these potential impacts.

Indirect Impacts: Same as direct impacts.

i. Recreation

Description of the Impacted Environment

The affected environment includes areas of commercial forest land on the Reservation dedicated to even-aged management and temporary even-aged management. The former consists more specifically of habitat groups E and F and selected stands of pure lodgepole pine. The latter includes specific stands in habitat groups B, C, and D where control of dwarf mistletoe is of primary importance.

Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

Environmental Consequences

Direct Impacts: Increasing the size of even-aged blocks could result in severe visual impact. Most research on relationships between visual quality and timber harvesting suggest that even-aged management, especially clearcuts, has substantial negative impact on visual quality. Since even-aged management will occur on a substantial portion of the Reservation's commercial forest land, the increased block size could have a significant visual cumulative effect. Such effects could be partly mitigated by considering visual resources in the location and design of the even-aged block.

Indirect Impacts: Decreased visual quality of reservation forest lands could adversely affect tourist recreational experiences as they travel through the Reservation, depending upon the visibility of the resulting blocks. Likewise, wilderness visitors could react negatively to such activity if it is visible inside the wilderness boundary.

j. Archaeology/Cultural Heritage

Description of the Impacted Environment

The impacted environment includes the commercial timber lands of the Reservation.

Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

Environmental Consequences

Direct Impacts: The same impacts are expected as those discussed relative to Precommercial Thinning Treatment Policy.

Indirect Impacts: The same impacts are expected as those discussed relative to Precommercial Thinning Treatment Policy.

k. Human and Community Developments

Description of the Impacted Environment

Economic well-being of the tribe and tribal members and related employment.

Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

Environmental Consequences

Direct Impacts: Generally speaking, this will reduce administrative costs of sale administration and preparation. The impact on tribal income, per se, is not clear since the BIA apparently incurs these costs. These large cutting units could, however, reduce logging costs/thousand and result in higher competitive stumpage.

Indirect Impacts: With a given budget, more work can be done with lower administrative costs.

l. Threatened and Endangered Species

Description of the Impacted Environment

All wildlife species that are classified as threatened and endangered existing on the Flathead Indian Reservation.

Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

Environmental Consequences

Direct Impacts: No significant effects will be realized.

Indirect Impacts: No significant effects will be realized.

m. Ecological Interrelationships

Description of the Impacted Environment

The impacted areas are habitat types E and F and some diseased or insect-damaged stands of lodgepole pine.

Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

Environmental Consequences

Direct Impacts: Even-aged management is questionable as a management practice for tolerant species. The regeneration of tolerant species becomes more difficult as the size of the cutting unit increases. Wherever possible, either small clearcuts or partial cuts should be used to mitigate the adverse effect of large clearcuts on tolerant species.

Clearcuts that cover large acreages limit the amount of ecotone and reduce the use of the area by game animals after harvest. Likewise, if the regeneration plan calls for natural seeding, frequent ecotones or shelter-woods favor better natural seeding. Most western conifer species drop the majority of their seeds within 200 feet of the parent tree. Large clearcuts present problems for reseeding.

Insect-damaged lodgepole pine stands can be managed as larger even-aged cutting units as long as the sites are not so dry that young regeneration cannot become established.

D. Mistletoe Control Policy

Background: The current management plan calls for treating one-third of all Class I and II mistletoe-infected stand acreage every 20 years. This schedule would provide for treating (even-aged harvest following by mistletoe control TSI or conversion to non-host species) all Class I and II acreage after 60 years.

a. Geology

Description of the Impacted Environment

Current cycle of treatment mitigates the impact of accelerated erosion and water quality degradation associated with even-aged harvest. Treating all of the infected stands over a 40-year period should not cause soil or nutrient loss on sites, provided that site preparation, harvest technology and rejuvenation procedures are carefully planned for each harvest site. Due to the extent of the infection, a great deal of care is needed to keep soil and nutrient loss to a minimum during harvest.

Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

Environmental Consequences

Direct Impacts: Soil loss and water pollution are the major impacts of clearcut harvest on infected stands. Mitigation of these problems depends upon clearcut size, slope, climate and rapidity of rejuvenation. By allowing a 40-year cycle to harvest the infected stands, and planning the harvest after site specific analysis, the impact of clearcutting can be minimized and other resources protected. Thinning control should not affect soil or water resources.

Indirect Impacts: A too rapid cutting rate or poor clearcut selection could cause long-term problems on the Reservation from soil nutrient leaching and soil erosion, as well as water quality degradation. Some small effects are inevitable, but a 40-year cutting cycle and planning care can reduce the impact on other resources from a broad program of clearcutting on the Reservation.

b. Surface Hydrology

Description of the Impacted Environment

The impacted environment consists of the forested land area of the Reservation except within the wilderness and primitive areas.

Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

Environmental Consequences

Direct Impacts: The hydrologic impacts of timber harvest have been discussed in previous sections.

The 40-year treatment period for mistletoe eradication will provide a safe average recovery period. Sites with higher productivity can be cleaned up more quickly.

Care should be taken to "spread out" the sanitation effort over all acreage so as to avoid overcutting in any one watershed.

Indirect Impacts: No significant impacts.

c. Range

Description of the Impacted Environment

The mistletoe policy will affect mostly transitory range, but some permanent forest ranges will also be affected. Habitat groups B, C, and D are affected, and the most severe problems are in habitat group C.

Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

Environmental Consequences

Direct Impacts: Treatment of infected stands by thinning or clearcutting will increase livestock and big game forage. Slash disposal is important in allowing unrestricted livestock use. Livestock grazing may be used to decrease regeneration problems caused by competing vegetation which is a problem in habitat group C. By allowing livestock to graze these sites during times of the year when forage is green, the herbaceous species can be reduced, bare ground can be exposed for tree regeneration, and tree seedlings should not be browsed.

Indirect Impacts: No significant impacts.

d. Soils

Description of the Impacted Environment

Mistletoe has infected about one-third of the Douglas-fir, western larch and lodgepole stands on the reservation. The current policy calls for treating about 4,000 acres of mistletoe-infected stands annually, primarily as a follow-up to a harvest cut.

The impacted areas would be those sites where dwarf mistletoe (*Arceuthobium* spp.) has become heavily established (Classes I - IV). There are no data to show which soils, if any, have the greatest damage from control of this parasite.

Nearly all land that is infected with dwarf mistletoe is scheduled for treatment, but it is not clear how long it will take to effectively treat all lands in classes I through IV. The original document stated 60 years, which is nearly the length of a rotation.

Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

Environmental Consequences

Direct Impacts: Dwarf mistletoe treatment impacts soils in several ways.

The proposed alternative is to accelerate treatment from 60 years to 40 years. Section III.D.3.j.2. states that it makes four to six cutting cycles to regulate a stand to near projected levels. Entry on compactable soils can harm the immediate growth potential of the site. Soils in groups 3, 7, 9, 10, 13, 14, and 17 (Appendices B and C) are most likely to be impacted.

If increased soil disturbance were to occur, erosion would increase on steeper slopes (Groups 11, 13, Tables 14 and 15).

e. Timber and Other Vegetation

Description of the Impacted Environment

All productive, timbered areas which are class I - IV mistletoe stands.

Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

Environmental Consequences

Direct Impacts: There is no scientific evidence that mistletoe can be eradicated by clearcuts of any reasonable size. Instead, more attention should be paid to using less susceptible species, shortening even-aged rotation times, and reducing mistletoe to manageable levels. This evidently is intended.

With the current amount of mistletoe, the policy to cover all mistletoe-infested stands in 40 years may absorb more of "allowable cut" harvesting, leaving few options for other stand condition treatments. Other factors that must be considered in the "allowable cut" harvesting include beetle problems, sale scheduling considerations, and manpower.

Indirect Impacts: No significant impacts.

f. Wildlife

Description of the Impacted Environment

All wildlife in mistletoe infected stands on the Reservation landbase.

Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

Environmental Consequences

Direct Impacts: Decadent stands infected with mistletoe (III.D.2. in the Management Plan) are often valuable habitat for wild ungulates as well as for many other wildlife species. Generally, treatment of mistletoe-infected stands will influence wild ungulates (deer, elk and moose) by reducing cover. If these cover areas are adjacent to or near winter foraging areas, the treatments will probably be detrimental to wild ungulates, especially so during severe winters.

It is not entirely clear in the Forest Management Plan that block size limitations will be used when managing stands infected with mistletoe. If not, then treatment of extensive areas would be detrimental to many forest wildlife species, but undesirable effects can often be reduced if block size recommendations are followed for both even and unevenaged systems.

g. Fisheries

Description of the Impacted Environment

Class I and II mistletoe-infected stands.

Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

Environmental Consequences

Direct Impacts: None except where policy detracts from sound management practices.

Indirect Impacts: No significant impacts.

h. Wilderness

Description of the Impacted Environment

Some of the Douglas-fir stands within the Mission Mountains

Wilderness are heavily diseased with dwarf mistletoe. Dwarf mistletoe causes extensive growth losses and is the most serious disease problem on the Flathead Reservation.

Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

Environmental Consequences

Direct Impacts: The Mission Mountain Tribal Wilderness Management Plan states: "Management should keep in mind that trees in the Wilderness are not a source of forest products and consequently concern should be focused on outside of the Wilderness." (Wildland Recreation Department 1983).

There will be no impacts on the Wilderness from this policy unless salvage/sanitation logging is necessary to protect timber values outside the Tribal Wilderness boundary. Since mistletoe control work will be performed primarily as follow-up work to a harvest cut, it does not appear that there is a need in the next five years to control mistletoe within the Tribal Wilderness.

Indirect Impacts: No significant impacts.

i. Recreation

Description of the Impacted Environment

Mistletoe has infected about one-third of the Douglas-fir, western larch, and lodgepole pine stands on the reservation, primarily in habitat groups B, C, and D. The current policy calls for treating about 4,000 acres of mistletoe-infected stands annually. Most of the work is follow-up to partial cuttings, including selection cuts, overstory removal, and cleanings under occasional shelterwood.

Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

Environmental Consequences

Direct Impacts: The proposed policy, involving a variety of silvicultural prescriptions, would accelerate treatment to cover all infected stands within 40 years. This would be accomplished by increasing the area rate of treatment or by shortening the re-entry period. The prescription is influenced by mistletoe infection class, slope, and density of the residual stand. Under the current policy, visual constraints play an active role in determining the maximum size of temporary even-aged cutting units, thus reducing the potential adverse visual impact. Under an accelerated treatment program, such visual and recreational values are likely to be given a reduced emphasis, thus potentially increasing negative consequences to them. Shorter periods between re-entry suggests long-term allocation to timber over other values.

Indirect Impacts: Indirect impacts would be limited to changes in recreationist behavior induced by the presence of logging and TSI activity for an extended period of time. Under this policy, larger areas of the forest are likely to be preempted for timber harvesting only because of more frequent activity.

j. Archaeology/Cultural Heritage

Description of the Impacted Environment

Mistletoe has infected about one-third of the Douglas-fir, western larch, and lodgepole pine stands on the reservation, primarily in habitat groups B, C, and D. The proposed policy calls for treating about

4,000 acres of Mistletoe infected stands annually, in a temporarily even-aged system, or harvest followed by mistletoe control tree stand improvement or conversion to nonhost species.

Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

Environmental Consequences

Direct Impacts: No significant impacts are anticipated.

Indirect Impacts: No significant impacts are anticipated.

k. Human and Community Developments

Description of the Impacted Environment (Sociological Analysis)

Potentially all forested lands, adjacent lands and those within visual access.

Discussion and Environmental Consequences (Sociological Analysis)

The dwarf mistletoe control strategies (Section III.D.3.) make no mention as to the extent of methods other than stand removal on sites where valuable timber stands might be important for public use. If methods other than removal might be used, those methods must be clearly explained for public scrutiny and decision-making.

Direct Impacts (Sociological Analysis): There could be loss of forest resource to the public.

Indirect Impacts (Sociological Analysis): None are expected.

Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

Economic Consequences (Economic Analysis):

Financial well-being of the tribe and tribal members.

Direct Impacts (Economic Analysis): Removal of slow-growing timber might be replaced with rapid growing young stands. The costs and benefits are not explicit.

Indirect Impacts (Economic Analysis): The entailing of sale contracts with timber purchaser requirements to destroy infected understory will imply an unestimated additional logging cost, and lower stumpage income could result.

l. Threatened and Endangered Species

Description of the Impacted Environment

All wildlife on the threatened and endangered species list which exist on the Reservation.

Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

Environmental Consequences

Direct Impacts: Management activities may displace threatened and endangered species. These activities should be seasonally avoided in areas critical to threatened and endangered species.

Indirect Impacts: Cover areas for grizzly bears will be reduced, but there may be some increase in bear food production in some areas.

m. Ecological Interrelationships

Description of the Impacted Environment

All lands on the Flathead Indian Reservation.

Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

Environmental Consequences

Direct Impacts: Dwarf mistletoe spreads at the rate of 15-25 feet per year. Each infected tree has the capability of infecting another tree or reinfecting itself each time the plant reproduces. No effective biological controls have been found, but some species of mistletoe do have a viral disease (J. Lowe, Personal Communication). It may take 20 years for the plant to reduce tree growth by 50%, but once infected, the growth reduction will occur.

The ecological impacts of the dwarf mistletoe management plan are highly dependent on how fast the planned treatments will eliminate the parasite. It is estimated that spread rates are fast enough to cover nearly all susceptible forest in 60 years. Such heavy infections as occur in some areas create ideal fuel conditions for wildfires that can destroy thousands of acres of valuable timber and wildlife habitat. The ecological impacts of this treatment cannot be evaluated until information is available on how long the control measures will take.

It is important to remove infected understory since these trees merely grow up to infect the new understory. Mistletoe on the best growth sites is far more serious than on poor sites. Habitat type groups C and D should be treated first to return them to their high growth rates. The only argument in favor of not proceeding to control mistletoe rapidly is that the "witches brooms" are often used by birds and squirrels for habitat (shelter). Some aphids cultured by ants also thrive on the foliage of living brooms, but all of these organisms can find alternative habitats.

Noncommercial forest land will apparently not be treated for dwarf mistletoe. It should be low priority, but if not treated, it will ultimately reinfect adjacent commercial lands.

E. Lodgepole Pine Management Policy

Background: In the past, lodgepole pine harvest has largely been unregulated post and pole cutting by tribal members. Recently, however, the tribes indicated by resolution that they want the Bureau of Indian Affairs to intensify lodgepole pine management to assure that the S&K Post and Pole Enterprise has a perpetual supply of raw material. The Bureau of Indian Affairs has inventoried the resource and is presently preparing a lodgepole pine management plan to develop and manage the lodgepole pine portion of the Flathead commercial forest. Lodgepole pine management is a political issue because individual tribal members make a living from the resource, and efforts to change from the traditional unregulated method of operations in lodgepole pine are controversial. The Bureau and the tribes feel that intensification of management in the lodgepole pine type is essential, but there are others who question the need for change.

a. Geology

Description of the Impacted Environment

Developing heretofore inaccessible, unused portions of the lodgepole pine resource will cause new disturbance on the forest lands, including possible road-building and harvesting activity. Such areas will be more prone to erosion, soil and nutrient loss, and possible water quality degradation. However, the total impact on the Reservation will not change greatly, given past practices in lodgepole pine harvest.

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: Direct impact of the opening of new areas for lodgepole harvest will cause increased erosion and soil loss associated with road-building and water quality reduction related to erosion. Depending upon harvest practice, stand removal could increase pollution of water and soil removal prior to stand regeneration. The overall impact on the Reservation should not change greatly, however, over that of past unregulated cutting practices.

Indirect Impacts: Long-term impact on new areas open for lodgepole pine harvest should primarily be related to the erosional component associated with new access routes into the forest. Careful site management should mitigate damage to other forest resources. However, development of new routes in the forest would have an adverse impact, particularly in areas of substantial soil development. Mitigation of increased roading is suggested by means of road closures to travel by the general public.

b. Surface Hydrology

Description of the Impacted Environment

The impacted environment consists of the heretofore inaccessible, unused portions of the lodgepole pine resources of the Reservation.

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: Unregulated activity in the lodgepole pine component is not in the best environmental interest. A small amount of poor practice can undo a lot of good planning and management.

Indirect Impacts: None are anticipated.

c. Range

Description of the Impacted Environment

Transitory range in groups C, D, and E will be affected.

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: Lodgepole pine types generally supply little grazable forage. Lodgepole stands which receive even-aged management may supply some transitory range.

Indirect Impacts: The attempt to secure a sustained yield of post and poles may increase thinning of stands at an earlier time. Therefore, there could be some increase in livestock forage, but the increase would probably be insignificant.

d. Soils

Description of the Impacted Environment (Physical Component)

Lodgepole pine stands included in this concern encompass 57,000 acres on the Reservation. Of this areas, only 36,000 acres (63%) are accessible. About one-third of these stands have been infected with a mistletoe. Habitat types include groups D, E, and F although post and pole management will be usually restricted to groups E and F. Slopes are less than 40 percent. Soils in these stands are usually found in Belt rocks (argillites and quartzites) and have a mantle of volcanic ash. The ash imparts many favorable characteristics to the soil, including very high infiltration rates and resistance to compaction.

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: One goal relative to lodgepole pine management is to access the lodgepole stands. Access requires the construction of 150 miles of roads, about half of which will be built during the 10 years to which this plan is addressed. The other half will be built during the next 10-year period. As harvesting continues, steeper slopes will be accessed because gentle slopes are entered first. Road construction will cause some significant adverse impacts to the soils as cut and fill slopes are notorious sites of soil erosion. Hydrologic impacts of roads is less certain, but where the roads are built in bedrock, they could intercept subsurface flow.

Other adverse impacts from harvesting lodgepole pine, especially for posts and poles, are soil disturbance and organic matter removal. As steeper terrain is entered, rubber tired skidders and crawler tractors will become more common for harvesting. Disturbance of the duff and volcanic ash will be substantial with this equipment. Duff disturbance is undesirable because the organic material protects the soil from raindrop impact and overland flow, precursors of erosion. Organic horizons also ameliorate soil temperature extremes. However, where the material underlying duff is volcanic ash, infiltration rates are very high before compaction and high afterward. Thus, compaction on ash soil is minor until disturbance of the duff occurs. Compaction of the exposed mineral soil is not so serious as with other soils. Mitigation of the adverse effects of heavy equipment would involve use of lighter equipment or other methods of lessening the disturbance.

Organic matter removal by whole tree harvesting from the site is mentioned in the management plan as a major concern. However, lodgepole pine stands are usually created by fire. Sites supporting lodgepole pine have burned many times, and each time nutrients, especially nitrogen, were volatilized and lost from the site. Still, the nutrient regime is able to support the species. While whole tree harvesting removes much of the fine stems and leaves where nutrients are concentrated by the soils, nutrient reserve is great enough to sustain growth.

Indirect Impacts: The most dangerous cumulative impact to soil from the lodgepole pine management plan is the loss of productive potential associated with erosion from cut and fill slopes. To the extent erosion occurs, it is an irretrievable commitment to short-term use.

Description of the Impacted Environment (Chemical Component)

Impacted areas are those that have burned and become established in lodgepole pine or that are too poor chemically to grow other than lodgepole pine. A variety of soils are concerned, mostly at medium to higher elevations.

Soils in lodgepole pine stands range from fertile bottomlands to extremely poor, marginal timber sites. The plan calls for a lodgepole pine management area. Trees will be grown at 1,200/acre for 40 years for posts and poles and also for longer-rotation saw timber.

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: Soils are of concern in three ways in lodgepole pine stands.

More frequent harvest can lead to rapid nutrient depletion on poor soils. Lodgepole pine often grows on poor soils.

Short-term harvests (40 years or less) lead to more frequent entry, greater chances of compaction and erosion. This is particularly true where skidders are used that make many repeat turns throughout the stand.

Slash disposal is a problem since it is usually piled to scarify the soil surface. Scarification does produce a good mineral seed bed for lodgepole pine and by itself is not harmful. Burning slash piles after piling and scarification causes the major problem. During dozer piling, fertile topsoil is moved into piles where it is subjected to intense heat (up to 1,560°F) that can damage the structure and physical nature of the soil (Eron 1977). Also, during piling, larger cull logs are pushed into piles where the intense heat usually consumes them. The result of dozer piling is that the best soil is heated and damaged, and the slash is burned, releasing large amounts of ash, which alters the chemistry of the soil. Small piles produce the same problem to a lesser extent. Often, slash piles will not support seedling growth, putting a sizeable area out of production for some time.

Broadcast burns are more hazardous, but create fewer hot spots and distribute the nutrients evenly over the forest floor. This is particularly true if the slash remains under the snow for a winter. Broadcast burns are usually light enough to save the large logs needed by mycorrhizae and nitrogen-fixing bacteria and result in fewer "hot spots" that cannot support seedling growth.

Mitigation measures are recommended. Soils in lodgepole pine stands should be examined for their nutrient levels. If the soils in a particular stand are chemically fragile (a condition of low nturient supply leading to nutrient shock or temporary loss of tree growth), that stand should not be harvested for poles on a short rotation. Only soils with enough reserve nutrients to grow the next three to four forest rotations should be harvested for saw logs, and those with nutrients adequate to support six or more rotations should be used for posts and poles (Stark 1982, 1983). Any stand that has more than 30% of any available biologically essential ion in the vegetation should not be harvested for sawlogs. If 15% of any ion (except nitrogen) is in the vegetation, the site is marginal for post and pole harvest; although no actual measurements of nutrient depletion from post operations are available. Any stand of lodgepole pine that receives high precipitation (>30 in/yr), is reasonably well stocked (800-1,000 trees/acre) and shows slow growth (<20 rings/inch) for young trees (< 40 years) should not be harvested at all. Harvest of these sites will produce serious site deterioration. Hot fires on soil groups 20, 21, and 26 (Tables 14 and 15) may be damaging to production because of excessively high nutrient levels. Although these criteria sound strict, only the poorest soils fail to meet harvest standards. Soils in groups 6, 16 and 25 are most likely to cause problems. These soils should have an adequate cation exchange capacity to store most of the ions released through burning (>9 meg/100 g, Stark 1981).

Lodgepole pine sometimes grows on compactable or erodable soils. These are physically fragile soils of groups 2, 3, 6, 9, 13, and 14 (Appendices B and C). Such soils should be managed carefully to avoid permanent damage to soil structure or extensive surface soil losses. Soils in group 12 are important where seed trees are to be left, since lodgepole pine on these soils is very subject to windthrow hazard. Group 12 should be much larger than it is (Appendices B and C). Greater care in planning is needed as the slopes approach 40%.

The plan should consider the physical and chemical properties of soils before decisions on frequency and intensity of harvest or slash diposal are made.

e. Timber and Other Vegetation

Description of the Impacted Environment

The impacted environment includes the heretofore inaccessible, unlogged portions of the lodgepole pine resource. Impacts will include disturbance to these sites, including construction of new roads and disturbance by logging activities.

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: Lodgepole pine can have very rapid juvenile growth. Its utility in short-rotation silviculture cannot be underestimated.

Lodgepole pine is a very hardy tree, is especially cold tolerant, and is often the easiest to regenerate.

Small sawlog mills have made lodgepole pine sawtimber potential, not just post and pole.

Whole tree harvesting-chipping may provide a market for any size tree.

Indirect Impacts: Doghair lodgepole pine should be converted as fast as markets allow if over 50 years old. If under 50 years old and growing on good sites, thinning is probably economical.

A well-managed lodgepole pine stand less than 80 years old is an efficient natural monoculture that is fire and disease resistant and requires little maintenance. Harvesting must occur at less than 80 year intervals to maintain stand vigor.

f. Wildlife

Description of the Impacted Environment

All forms of wildlife present on the reservation.

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: The importance of lodgepole stands as mule deer, elk, and moose summer range is recognized in the Forest Management

Plan (Section III.E.11.). Block size limitations will be observed. Reduction of habitat effectiveness for elk, and perhaps deer and moose, because of increased access, appears to be the greatest cause for concern in increased lodgepole pine management. However, possible detrimental effects from increased access can be reduced by road closures.

g. Fisheries

Description of the Impacted Environment

All commercially available forest lands within the reservation, particularly those containing lodgepole pine.

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: Impacts will be site specific and will depend upon site topography and ability to produce new growth. Impacts will be primarily seen as increases in water yield and sedimentation. Road construction may also be a problem. Mitigation is discussed in the Forest Management Plan (Section III.D.6.b.) and involves establishment of Restricted Management Zones to ensure proper management of streamside zones.

Indirect Impacts: Long-term impacts will be related to the ability to produce new vegetative cover.

h. Wilderness

Description of the Impacted Environment

Lodgepole pine stands occupy the upper reaches of several watersheds, including Mill Creek, Seepay Creek, Revais Creek, North and

South Forks of Valley Creek, the Jocko River and several others. Extensive stands of lodgepole pine are visible from most areas on the Reservation, and their visibility contributes most of their recreational and aesthetic value (Flathead Reservation Timber Management Plan, Section III.E.11.).

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: It is difficult to predict impacts on the wilderness resource. In general, the same types of impacts as those associated with timber sales would be present, but to a lesser degree.

Lodgepole pine harvesting may occur in close proximity to wilderness boundaries, resulting in various sight and sound impacts.

Indirect Impacts: None are anticipated.

i. Recreation

Description of the Impacted Environment

Lodgepole pine stands included in this concern encompass 57,000 acres on the Reservation. Of this area, approximately 36,000 acres are currently accessible. About one-third of the lodgepole pine stands are infected by mistletoe. Lodgepole pine stands occur in habitat groups D, E, and F.

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: The current policy calls for intensive management of lodgepole pine stands, affecting about 15,000 acres over a 40-year conversion period. This suggests about 375 acres of harvest a year. About 150 miles of new road construction will be ultimately required to access this resource. The current policy could disrupt visual and recreational values if they are not accounted for in the process of identifying which areas will be subject to intensive management. Construction of 150 miles of new road will reduce the amount of unroaded opportunities available, but provide access for other types of opportunities. Controlled road location, however, may overcome adverse impacts associated with past policies. Mechanized thinning operations conflict visually with the surrounding forest depending on the alignment and position of the viewer.

Indirect Impacts: Intensive lodgepole pine management may reduce the negative indirect consequences associated with the previous policy.

j. Archaeology/Cultural Heritage

Description of the Impacted Environment

The impacted environment includes the near 57,000 acres of lodgepole pine stands on the reservation where sites of archaeological and cultural heritage value may occur.

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: None are anticipated.

Indirect Impacts: None are anticipated.

k. Human and Community Developments

Description of the Impacted Environment

The tribe has established an enterprise (post and pole yard) which is currently using a more or less unrestricted lodgepole pine resource base. The plan calls for conserving the lodgepole resource in accord with BIA policy. Financial well-being of the tribe and tribal members could be affected.

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: The ultimate goal would be to establish a reasonable base for a long-term operation.

Indirect Impacts: Conserving the lodgepole pine which may well be the commercial species of greatest importance in the future.

l. Threatened and Endangered Species

Description of the Impacted Environment

All species of wildlife currently existing on the reservation which are on the threatened and endangered species list.

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: There will be no significant impact on the peregrine falcon and bald eagle by implementing any of the mentioned lodgepole pine management policies. However, cover for the grizzly bear and wolves may be reduced as a result of the intensive lodgepole management activities.

Indirect Impacts: Increased management of lodgepole pine stands may increase human access in areas important to grizzly bears, and perhaps wolves. Access to such areas should be closed following logging.

m. Ecological Interrelationships

Description of the Impacted Environment

The impacted areas are largely habitat groups D and E (Table 13) for lodgepole pine and western larch (50% each), and group F which is in the subalpine zone.

Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resources.

Environmental Consequences

Direct Impacts: Ecologically, the lodgepole pine management areas have much to offer. Controlled burning will be used to maintain periodic fire in the ecosystem which favors lodgepole pine and maintains selection pressure to encourage serotony. For this reason, planting is not wise in lodgepole pine stands, since most field collected seed are nonserotinous. Care is needed to avoid intensive harvest on chemically fragile soils and to use broadcast burns as much as possible on all soils. Light burns will favor resprouting of native huckleberries for wildlife use in these stands, but hotter fires will destroy the below-ground rhizomes (Miller 1976). After fire, heavy fruiting of huckleberries may be delayed by 6-20 years. As long as lodgepole pine stands are not burned too frequently or at too high temperature (> 570°F) and fuel loadings, they can create quality watersheds and even maintain recreational value. The greatest threat to lodgepole pine stands is too frequent or intense harvest on poor soils. Thinning is essential if natural regeneration is encouraged, since overstocked lodgepole pine stands represent a poor use of the land resource.

Two possible fringe benefits of lodgepole pine forests are their value for houselogs and huckleberry production. The plan is reasonable.

F. Marginally Productive Sites Policy

Background: The Bureau of Indian Affairs expends human and financial resources managing sites producing less than 20 cubic feet per acre per year (e.g., ponderosa pine/bunchgrass and upper subalpine habitat types). In many cases, harvest entry in these types is only marginally economical. Some feel that all forested lands should be equally managed, others feel that management should focus their efforts only on the "better," more productive sites.

a. Geology

Description of the Impacted Environment

Marginally productive sites as described in this concern are usually timberline habitat types. Soil components are limited, the terrain is steep and rocky, and the area possesses high qualities for wildlife and watershed values. Any harvest disturbances can greatly upset and perhaps destroy the other values over a very long time.

These areas are usually underlain by Beltian rock formations, are not easily weathered, form unstable, fractured, steep slopes, and are susceptible to rapid mechanical weathering as opposed to chemical weathering. Soil formation is very slow.

Proposed Alternative: Identify lands with productive capabilities of less than 20 $ft.^3$/A/yr. and de-emphasize timber management.

Environmental Consequences

Direct Impacts: Direct impacts on harvested sites can include very rapid soil erosion, stripping of associated vegetation, short-term, rapid increase in chemical leaching of the bedrock, destruction of big game habitat and some water quality degradation by increased stream loading. Thus, the proposed alternative to de-emphasize timber management on these marginal sites is considered appropriate to protect these sites.

Indirect Impacts: Indirect impacts of this alternative are to protect other important values (wildlife and water) in perpetuity on the Reservation. In addition, because such small and unproductive areas are involved, the economic loss to the reservation should be very small over time.

b. Surface Hydrology

Description of the Impacted Environment

The impacted environment consists of the entire land area of the Reservation including the Mission Wilderness, Jocko Primitive Area and the Nine Mile Divide. Impacts will differ according to past fire history, fire ecology of the vegetation, past and present cultural resources, and past and present cutting and slash disposal practices.

Proposed Alternative: Identify lands with productive capabilities of less than 20 ft.^{3}/A/yr. and de-emphasize timber management.

Environmental Consequences

Direct Impacts: By de-emphasizing timber management in marginally productive stands, there will be less chance of water resource degradation. The prime concern in these locations is recovery. By limiting management to sanitation/salvage and small group selection to enhance other resources, there will be minimal site disturbance or water yield increases produced.

In the discussion of silvicultural considerations for the upper subalpine habitat types, snow redistribution is inferred. It is generally considered that snow redistribution is not significant in western Montana. Snow desynchronization was discussed in the Fire Suppression Policy section. The snowmelt period is often lengthened by desynchronization, but water yield increases are only achieved by a reduction in evapotranspiration and reduction of soil moisture recharge requirements in managed areas, not by increasing snowpack depth in small openings.

Indirect Impacts: No significant impacts will be realized.

c. Range

Description of the Impacted Environment

This concern will influence permanent forest range. For forest habitat group A (open pine-fir bunchgrass habitat types), harvest recent dead, high risk and imminent mortality trees as well as all age class 3 trees with C and D vigor crowns. The percentage harvest in the later category will depend on the primary resource value of the area. For example, to enhance production of grasses, more of the canopy has to be removed.

Proposed Alternative: Identify lands with productive capabilities of less than 20 $ft.^3$/A/yr. and de-emphasize timber management.

Environmental Consequences

Direct Impacts: The de-emphasis of timber management on these sites will have few direct effects.

Indirect Impacts: If thinning programs for the sites in group B are reduced substantially, there could eventually be a loss in forage production because of the negative relationship between forage and canopy cover.

d. Soils

Description of the Impacted Environment

"Marginal sites" as used in the Management Plan refers to sites with low productivity because of drought or cold temperatures. Chemically fragile soils that can also cause low production are not recognized. Chemically fragile soils are thought to exist in the Reservation, but the extent is unknown. In reference to Appendices B and C in Part 1 of the assessment, soils groups 1 (south slopes), 4, 6 (higher elevation or south slopes), 8 (south slopes), 11 (high elevation), 15 (high elevation units) and 16 belong in this category of potentially marginal sites under the Management Plan. If chemically fragile soils are considered, then groups 20, 21 (calcareous), 22 (alkaline), 23 (acid) and 25 (low nutrients) would be added (Appendices B and C).

Two forest habitat management groups have low to very low productivities. Group A is mostly Douglas-fir/bunchgrass habitat types. These types are relatively unproductive because they are very dry sites and available soil moisture is limiting. This group occurs at low to mid elevations, frequently on steep slopes. Group G occurs at very high elevations (near timberline) where very low temperatures limit plant growth.

Proposed Alternative: Identify lands with productive capabilities of less than 20 $ft.^3$/A/yr. and de-emphasize timber management.

Environmental Consequences

Direct Impacts: As indicated under the Soils section in the Lodgepole Pine Management Policy, chemically fragile soils can be recognized by slow growth of well-spaced trees on soils that are not excessively well-drained, or cold, and which receive at least 25 inches of annual precipitation (Stark 1983b). These ecosystems may have 30% or more of some biologically essential and available nutrients in the organic phase and should not be harvested. Soils of this type are often deficient in available nutrients and easily subjected to nutrient shock from intensive harvest. Habitat types that relate poorly to soils may not always be useful in recognizing chemically fragile soils.

Management of the cold or dry units will be selective, with harvesting of trees only where they can be safely removed with some assurance of renewal of the original stand. The proposed sanitation and salvage occurring on marginal sites should pose no problem as long as the removal of trees will not result in excessive loss of nutrients, or increased erosion or compaction of already poor soils. Dry soils may be less easily damaged than shallow soils, but heavy equipment on a compactable dry soil when it is wet can do considerable damage by reducing air spaces. Wet or cold soils are easily damaged since they usually remain wet much of the year. Mitigation measures should include entry onto marginal soils only when they are dry or deeply frozen. Cold soils cannot easily be made warmer, nor can dry soils be easily made more moist.

The policy of minimal logging activity on soils of marginal fertility ($<$15 ft^3/yr of wood production) is sound, but chemically fragile soils also need to be identified and managed carefully. Habitat types are not adequate to allow identification of chemically fragile soils.

Indirect Impacts: None are anticipated.

e. Timber and Other Vegetation

Description of the Impacted Environment

All commercial forest lands of the Flathead Indian Reservation.

Proposed Alternative: Identify lands with productive capabilities of less than 20 ft.^{3}/A/yr. and de-emphasize timber management.

Environmental Consequences

Direct Impacts: No direct impacts are expected.

Indirect Impacts: No indirect impacts are expected.

f. Wildlife

Description of the Impacted Environment

All forms of wildlife species (especially big game) existing on the Flathead Indian Reservation.

Proposed Alternative: Identify lands with productive capabilities of less than 20 $ft.^3$/A/yr. and de-emphasize timber management.

Environmental Consequences

Direct Impacts: Generally, it is not possible to increase wildlife values by logging mature stands in open pine-fir/bunchgrass habitat types (group A), because a good interspersion of cover and forage already exists. If an area has excess cover because of a large expanse of stagnant mid-seral ponderosa pine or Douglas-fir, grass production may be increased by overstory removal and fire. Care should be used to retain portions of the stands to provide cover.

Indirect Impacts: Contrary to the Management Plan (Section III.D.2.), it is highly unlikely that any significant benefits for wildlife forage or browse production by logging the upper subalpine habitat types (group G). Forage is not a limiting factor for ungulates at the time of year they graze these areas. Any possible wildlife benefits obtained by logging these types would likely be outweighed by the detrimental effects of cover removal and accessing these areas.

g. Fisheries

Description of the Impacted Environment

Marginally productive timber lands within the Reservation will be impacted.

Proposed Alternative: Identify lands with productive capabilities of less than 20 $ft.^3$/A/yr. and de-emphasize timber management.

Environmental Consequences

Direct Impacts: No significant impacts.

Indirect Impacts: No significant impacts.

h. Wilderness

Description of the Impacted Environment

Areas of marginal timber productivity will in most cases be managed for other resource values. Large areas of the forest lands adjacent to the tribal Mission Mountains Wilderness boundary fall in this category of marginally productive sites due to their elevation.

Specific ecological impact on the wilderness is difficult to generalize, but will probably be limited unless timber sales are contiguous to the wilderness boundary. The primary impacts will be visual effects on the vicarious wilderness appreciation of some tribal members.

Proposed Alternative: Identify lands with productive capabilities of less than 20 ft.^{3}/A/yr. and de-emphasize timber management.

Environmental Consequences

Direct Impacts: Marginally productive sites may serve as a wilderness buffer. Effectiveness as a buffer would be removed if these sites were cut or otherwise manipulated.

Indirect Impacts: No significant impacts foreseen.

i. Recreation

Description of the Impacted Environment

The affected environment includes all commercial timberland with recreational value within forest habitat groupings A (primarily ponderosa pine or Douglas-fir/bunchgrass) and G (timberline vegetation). Such areas comprise about 6% of the forested lands on the Reservation.

Proposed Alternative: Identify lands with productive capabilities of less than 20 ft.^{3}/A/yr. and de-emphasize timber management.

Environmental Consequences

Direct Impacts: The suggested policy of de-emphasizing timber harvesting in marginally productive areas will reduce any negative consequences to recreational opportunities and experiences resulting from the current policy. Timber harvesting in these areas designed to achieve other objectives (wildlife, water, etc.) may enhance visual and recreational opportunities as long as these values are considered in the prescription.

Indirect Impacts: There appear to be no significant indirect impacts to recreational values as a result of pursuing this alternative.

j. Archaeology/Cultural Heritage

Description of the Impacted Environment

All commercial forest lands on the Reservation.

Proposed Alternative: Identify lands with productive capabilities of less than 20 ft.^{3}/A/yr. and de-emphasize timber management.

Environmental Consequences

Direct Impacts: None are anticipated.

Indirect Impacts: None are anticipated.

k. Human and Community Developments

Description of the Impacted Environment

All "unproductive" forested lands. All areas within visual access of them.

Discussion and Environmental Consequences

Management of the forest must be consistent with sound social and natural ecological principles. Guidelines must be established which will protect all areas and timber stands, regardless of commercial value. On those areas of low timber productivity, timber management should be de-emphasized to protect the timber resource.

Proposed Alternative: Identify lands with productive capabilities of less than 20 ft.^{3}/A/yr. and de-emphasize timber management.

Direct Impacts: De-emphasizing harvesting of low production sites will prevent adverse impacts on sites of value as cultural, spiritual, social, recreational or wildlife areas. Aesthetic damage can be prevented. Thus, this proposed alternative should not lead to adverse impacts.

Concentration of available investment funds on the more productive sites (including accessibility) will assure a better investment return than spreading funds across all sites.

Indirect Impacts: If investment capital is limited, this proposed alternative will be an acceptable alternative. No indirect impacts are expected.

1. Threatened and Endangered Species

Description of the Impacted Environment

All threatened and endangered species existing on the Flathead Indian Reservation.

Proposed Alternative: Identify lands with productive capabilities of less than 20 ft.^{3}/A/yr. and de-emphasize timber management.

Environmental Consequences

Direct Impacts: Care should be used in group A habitat types (low productivity types) to avoid disturbance or destruction of bald eagle roosting or nesting sites. De-emphasizing timber management on these roosting/nesting sites should mean no site disturbance. Else, adverse impacts on bald eagles could result.

Indirect Impacts: Uncontrolled human access to group G subalpine habitats (low productivity sites) will be generally harmful to grizzly bears. If these areas are accessed, the roads should be closed to vehicular travel by the general public during summer and autumn. De-emphasizing timber management on these sites should include a minimum of human activity associated with timber management. Else, an adverse impact on grizzly bears could result.

m. Ecological Interrelationships

Description of the Impacted Environment

The impacted areas are the least productive portions of habitat groups A, B, F and G (Table D).

Proposed Alternative: Identify lands with productive capabilities of less than 20 ft.^{3}/A/yr. and de-emphasize timber management.

Environmental Consequences

Direct Impacts: The plan to minimize logging activity on marginally productive sites is sound as long as it is recognized that chemically fragile soils can occur in any habitat type and should be identified for special management along with the dry and cold sites. The value of these units for wildlife, grazing and watershed is recognized and management concerns consider the best use of such lands.

The Management Plan calls for occasional entry to remove diseased or insect-damaged trees. This is important ecologically since the marginal sites for tree growth are characterized by stress and are subject to frequent epidemics. These areas need to be sanitized to protect adjacent commercial forests from spread of epidemic populations. This is particularly true of bark beetles that often become well-established in the 10-inch tree class in marginal or over-stocked stands. Frequent (every 12-15 years) light ground fires can be beneficial to the health of the trees and to forage production for wildlife and livestock in these marginal areas. The soil should be moderately deep (> 20 inches), have an adequate cation exchange capacity (>5 meg/100g) to store the released nutrients, and should not receive excessive precipitation (<40 inches). Light fires provide frequent light fertilization to sustain ecosystem productivity.

Generally, the policy of minimal management in marginal areas is ecologically sound, but the definition of marginal production may have to go beyond what is known of habitat types. Periodic light fire may be an essential occurrence on marginally productive sites.

IV. Other Resources

A. Stream Reserve Corridor Policy

Background: Research has demonstrated that streamside habitat and vegetative communities are critical to many species of fish and wildlife and to water quality. The tribes and BIA want to protect these critical areas from timber harvest damage but only to the extent necessary since economic timber tradeoffs are required. Present policy requires that a two-chain-wide reserve be left on each side of live streams and that all harvest activities (e.g., skidding, etc.) be excluded from the reserve area. Presently, the streamside reserve acreage is not deducted from the timber base. The real issue is whether or not the present streamside reserve policy is too inflexible.

a. Geology

Description of the Impacted Environment

Riparian vegetation constitutes one of the most environmentally sensitive parts of the ecosystem, yet in many ways, one of the least understood. Interactions of vegetation, bank stability, water temperature and water quality parameters are intimately related. Development of a policy that preserves and protects the critical parameters that affect streamside habitat and associated water quality and fishery characteristics is necessary.

Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

Environmental Consequences

Direct Impacts: This alternative will protect the geology of stream, streamside, and vegetative communities.

Indirect Impacts: None are anticipated.

b. Surface Hydrology

Description of the Impacted Environment

The impacted environment consists of the entire land area of the Reservation including the Mission Mountains Wilderness, Jocko Primitive Area and the Nine Mile Divide. Impacts will differ according to past fire history, fire ecology of the vegetation, past and present cultural resources, and past and present cutting and slash disposal practices.

Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

Environmental Consequences

Direct Impacts: The Management Plan does an excellent job in acknowledging the importance of riparian zones for all uses.

Classifying all riparian/water influence zones as restricted timber management zones should furnish adequate protection on most sites, particularly where a two-chain-wide reserve is left on each side of live streams. However, buffer zone requirements vary with slope, aspect and wildlife use. All harvest activities needn't be excluded from these zones as long as site disturbance is kept to a minimum. The harvest should only be for sanitation purposes. Windthrow is a common problem in buffer strips. While log and debris jams are a normal occurrence in streams, artificially producing greater numbers of them increases the probability of "catastrophic" failures. The sudden release of impounded water can produce great channel degradation and a "domino effect" on downstream jams. It takes many years for a channel to become stabilized following one of these events. The increase in sediment yield is unacceptable.

Indirect Impacts: No significant effects will be realized.

c. Range

Description of the Impacted Environment

All permanent and transitory rangeland.

Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

Environmental Consequences

Direct Impacts: Riparian zones provide excellent grazing for livestock. These zones are relatively flat, forage remains green all or most of the growing season, and the site is by water. If the tree cover is reduced, livstock forage would be increased.

Indirect Impacts: The combination of water and the associated lush habitat makes riparian habitats very important multiple-use areas. Overgrazing is a major cause of riparian deterioration. Riding or herding of livestock is necessary to keep the animals from riparian areas. With overuse by livestock, the value of the site for wildlife is reduced. Livestock use could be reduced by altering allotments to increase transitory range.

d. Soils

Description of the Impacted Environment

Impacted areas are all areas with riparian vegetation or swamplands, or all timberlands within 100 feet of perennial streams. Soil groups 9, 10 and, to some extent, 7 will be impacted in bottom lands and groups 13, 14, 17, 6 and 11 on steep land away from streams (Appendices B and C).

Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

Environmental Consequences

Direct Impacts: The plan calls for road access to streams and logging methods that will minimize erosion. Compaction also increases surface runoff and sedimentation in streams (Curry and Cartier 1980). The plan calls for reasonable controls of damaging activities on the periphery of streams, but does not mention swamps or wet lands. The same precautions should apply to all wet lands.

Operations away from the stream periphery that will influence water yield and quality have been addressed through plans to minimize logging on compactable soils when they are wet. Strict supervision of skidding activities is prescribed in the plan. Slope percent (>70%) susceptible to erosion is a bit high. Erosion serious to growth and streams can occur on slopes of >70%. Slump potential increases with the steepness of slope, but the nature and orientation of the clay micelles are thought to determine when a saturated soil will slump (R. Taskey, personal communication).

Indirect Impacts: Skidding and logging activities on snow are recommended for reducing compaction and surface soil disturbance. Although this is a good practice to reduce compaction, the use of heavy equipment on snow causes excessively deep soil freezing, death of micro-organisms and sometimes death of roots (Wettersten 1970).

groups 9, 10 and, to some extent, 7 will be impacted in bottom lands and groups 13, 14, 17, 6 and 11 on steep land away from streams (Tables 14 and 15).

Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

Environmental Consequences

Direct Impacts: The plan calls for road access to streams and logging methods that will minimize erosion. Compaction also increases surface runoff and sedimentation in streams (Curry and Cartier 1980). The plan calls for reasonable controls of damaging activities on the periphery of streams, but does not mention swamps or wet lands. The same precautions should apply to all wet lands.

Operations away from the stream periphery that will influence water yield and quality have been addressed through plans to minimize logging on compactable soils when they are wet. Strict supervision of skidding activities is prescribed in the plan. Slope percent (>70%) susceptible to erosion is a bit high. Erosion serious to growth and streams can occur on slopes of 70%. Slump potential increases with the steepness of slope, but the nature and orientation of the clay micelles are thought to determine when a saturated soil will slump (R. Taskey, personal communication).

Indirect Impacts: Skidding and logging activities on snow are recommended for reducing compaction and surface soil disturbance. Although this is a good practice to reduce compaction, the use of heavy equipment on snow causes excessively deep soil freezing, death of micro-organisms and sometimes death of roots (Wettersten 1970).

With a limited number of passes, this damage is probably not extremely important. The way the soil freezes and if it freezes before snowfall can influence damage from heavy equipment in winter. If the soil is wet and freezes quickly, it forms solid blocks with little volume change or crystal formation. Travel over this soil or snow will do minimal damage to the soil. If the soil is wet and loamy in texture and freezes slowly, crystals form and loosen the soil. Vehicle travel over soil on this condition will cause collapse of the crystals, even with snow cover, resulting in greater soil damage. The plan addresses the soil aspects of riparian zones adequately, but upslope influences must always be kept in mind. Plans should include at least visual examination of streams for sediment load in logging areas.

e. Timber and Other Vegetation

Description of the Impacted Environment

Timberlands within 100 feet of perennial streams.

Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

Environmental Consequences

Direct Impacts: Impacts are loss of timber from resource base. Riparian sites can have the highest growth rates in the area if well drained.

Optimally, silvicultural judgement to provide sanitation logging near the stream is best.

Indirect Impacts: There may be blowdown losses due to the relatively narrow strip of mature trees.

Retaining decadent old-growth could provide an insect and disease center.

If the acreage cannot be harvested, it is not realistic to have it in the commercial timber base.

f. Wildlife

Description of the Impacted Environment

All forms of wildlife inhabiting or using the riparian environments of the Flathead Indian Reservation.

Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

Environmental Consequences

Direct Impacts: Numerous wildlife species require or show preference for riparian habitats and moist sites in general for all or a portion of their life cycle.

Considerable research data are available to show that elk select moist habitats on summer and early fall ranges. This selection may be very important in the relative reproductive success of elk. At present it is not clear that riparian or other moist sites can be improved overall for wildlife by logging. Therefore, liberal use of the No Management Zone classification for moist sites would probably be most favorable from a wildlife point of view.

Indirect Impacts: No significant impacts will be realized.

g. Fisheries

Description of the Impacted Environment

Impacts will be on riparian zones and associated aquatic habitats.

Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

Environmental Consequences

Direct Impacts: Riparian zone protection is absolutely essential to the maintenance of good quality fisheries habitat. The proposed alternative should be adequate to protect the fisheries resource in most streams. If a two-chain-wide reserve is left on each side of a live stream, it should generally be adequate. However, a better policy might be to develop specific reserve policies on different classes of streams and then deduct the area from the timber base.

Indirect Impacts: None except as note elsewhere.

h. Wilderness

Description of the Impacted Environment

There will be no impacts on the streams in the wilderness resulting from timber harvest, since all proposed sales are at a lower elevation than the wilderness. It is important to remember, however, that most access routes and portals into the Mission Mountains Wilderness follow streams and riparian corridors.

Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

Environmental Consequences

Direct Impacts: If salvage/sanitation logging to control insects and disease occurs within wilderness, ample corridors along streams will help to minimize impacts.

Indirect Impacts: None.

Environmental Consequences

Direct Impacts: None are anticipated.

Indirect Impacts: None are anticipated.

k. Human and Community Developments

Description of the Impacted Environment (Sociological Analysis)

All forest areas which include streams in their natural ecology.

Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

Environmental Consequences

Direct Impacts (Sociological Analysis): No adverse impacts are expected.

Indirect Impacts (Sociological Analysis): No adverse impacts are expected.

Description of the Impacted Environment (Economic Analysis)

Economic well-being of tribe and tribal members and related employment.

Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

Environmental Consequences (Economic Analysis)

Direct Impacts (Economic Analysis): Streamside set asides will reduce cash receipts but maintain higher water quality (an unenumerated benefit). Generally, riparian habitats are exceptionally productive in terms of forest growth.

Indirect Impacts (Economic Analysis): Care must be given to be assured that allowable cut levels reflect the site quality of riparian habitats withdrawn from harvest.

1. Threatened and Endangered Species

Description of the Impacted Environment

Riparian environments which are frequented by species of wildlife on the threatened and endangered species list.

Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

Environmental Consequences

Direct Impacts: Bald eagles usually nest within one-half mile of large streams, rivers, or lakes; and often nest adjacent to water. Also, nesting cliffs of peregrine falcons usually overlook water (within one-half to one mile). Care should be taken to insure that management activities along or near streams do not displace nesting bald eagles or peregrine falcons. Grizzly bears use riparian areas in spring and again in autumn, and will probably be displaced by management activities on streams at these seasons.

Indirect Impacts: Increased access along streams may result in increased disturbance of nested bald eagles or peregrine falcons. Similarly, grizzly bears may be displaced from critical spring or fall feeding areas, or there may be an increase in bear-human encounters. These detrimental effects can be reduced by road closure.

Overstory removal and/or soil disturbance may increase bear foods (berries, forbs, and graminoids), but there is no good evidence at present to show that this is a limiting factor for grizzly bears. It is more important to reduce the probability of bear-man encounters.

Any action which reduces fish in large streams, rivers, or lakes may be detrimental to bald eagles.

m. Ecological Interrelationships

Description of the Impacted Environment

The impacted areas are all riparian and wetland ecosystems.

Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

Environmental Consequences

Direct Impacts: The Management Plan calls for protection for all streamside vegetation to maintain good water quality and habitat for wildlife. This plan is sound in that it recognizes the probable need to introduce special management to favor wildlife over time. Riparian zone trees often grow to large sizes. They are susceptible to windthrow since they grow in wet or moist soils and typically have shallow roots (<12 inches). Root rots sometimes weaken trees in riparian habitats. Windfall in these areas is common and may produce dense tangles of downed boles in old streamsides. This downfall restricts the movement of the large ungulates, hinders their access to water and can trap animals, making them easier prey while feeding or drinking. Riparian zones are often heavy browse areas. In old, undisturbed systems, shrubs can become extremely dense excluding some animals from moving freely through the area. Brush to a moderate density favors browsing and cover, but most brush species require periodic disturbances to promote resprouting that provides better quality browse. Some shrub cover is needed for shading to prevent excessive heating of the streams. Some disturbances of stream sides is needed.

Another problem in riparian zones is windfall blocking the streams and interfering with fish movement. Logs can change the turbulence patterns of streams altering plunge pools and bottom sediment patterns essential to spawning.

These observations suggest that some management of riparian habitats is needed even though they will not be intensively managed for timber. It might be possible to reserve a series of streams for partial harvest by helicopter once every 70-100 years to open them up and reduce deadfall. This could be done only if it would not interfere with wildlife.

Careful coordination with both terrestrial and aquatic wildlife experts is needed to decide if and when to thin and if brush thinning would benefit wildlife.

Indirect Impacts: No significant impacts will be realized.

B. Big Game Winter Range

Background: Big game often can only utilize 10% of their total range in the winter. Winter is a time of severe weather and food shortage, and therefore may be a limiting factor to the big game population. Present policy is to consider winter range on a sale by sale basis and exclude those areas identified by wildlife biologists as key winter range. The tribes and BIA both feel that big game management on the Reservation is essential.

a. Geology

Description of the Impacted Environment

Logging of winter game range, depending upon site and climatic conditions, can increase the rate, amount and type of erosion, degrade water quality in general and increase the incidence of site instability. Timber management activities are critical to preserving the character and utilization of winter game range, reducing erosional impacts and best utilizing natural resources for the benefit of the tribe. Some general increases in erosion, and therefore water pollution will occur with logging on previously untouched game preserve lands.

Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

Environmental Consequences

Direct Impacts: The direct impact of logging game range is to disturb the site, remove cover, increase erosion and increase the rate of solution activity in soil and rocks, thereby depleting soils and degrading water quality. The associated impacts of road building to the game range also have a pronounced adverse effect. With any widespread harvest activity in these areas, increases in siltation, soil removal, water quality degradation through leaching, etc. will occur. The proposed alternative will minimalize these problems.

Indirect Impacts: Over the long-term, a broad program of new site disturbance can have an adverse environmental effect on soil and water. Mitigation is possible on selected sites, and harvest technology can be adapted to the site requirements. Some long-term effects will be measurable, however, and together with the challenge to maintain big game habitat, this will provide the land and game managers with problems that will require an active program of research and field testing. The proposed alternative will minimalize these problems.

b. Surface Hydrology

Description of the Impacted Environment

The impacted environment consists of the entire land area of the Reservation including the Mission Mountains Wilderness, Jocko Primitive Area and the Nine Mile Divide. Impacts will differ according to past fire history, fire ecology of the vegetation, past and present cultural resources, and past and present cutting and slash disposal practices.

Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

Environmental Consequences

Direct Impacts: Designation of big game winter range will not adversely impact surface hydrology. Limiting other management activities will help maintain high water quality.

Indirect Impacts: No significant impacts will be realized.

c. Range

Description of the Impacted Environment

Permanent forest range and grasslands.

Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

Environmental Consequences

Direct Impacts: No significant impacts will be realized.

Indirect Impacts: This policy should reduce competition problems between wildlife and livestock. However, areas where roads are increased will have an increase in livestock use and invasion of unwanted plant species.

If riparian areas are harvested, tree regeneration problems would be likely because of cattle concentrations on these sites.

d. Soils

Description of the Impacted Environment

Snow depth is very important in determining the seasonal distribution and survival of deer, elk and bighorn sheep. These species concentrate during the winter on small tracts that are usually steep, south-facing, slopes at low elevations where snow does not accumulate. Because these sites are also quite dry, there are usually few trees (low canopy coverage) occupying the sites. Browse is heavily used, especially during winters of deep snow pack. The management of big game winter ranges is absolutely critical for the maintenance of these big game species.

Soils on these sites are shallow, stony and with little organic matter accumulation (duff) on the surface or in the soil: they are usually formed in Belt rocks (argillites, quartzites and some limestones). They have low water-holding and nutrient-retention capacities, and they are quite erosive.

Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

Environmental Consequences

Direct Impacts: Winter range potential must be considered on a sale by sale basis because each area is unique. However, excluding timber management altogether would have some unfavorable impacts. If tree density on winter ranges is not controlled by burning or logging, canopy coverage will increase and browse species will be shaded out. It is better to have a flexible policy that permits limited types of management practices on winter ranges. Some federal agencies are using fire and logging to improve winter ranges.

Few direct, adverse impacts should be noted on the soil.

Indirect Impacts: Cumulative impacts of a policy that does not permit imaginitive management should result in decreasing the quality and size of winter ranges and reductions in big game populations. However, long-range, cumulative impacts on the soil would be minimal.

e. Timber and Other Vegetation

Description of the Impacted Environment

All timberlands which are used by big game as wintering areas

Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

Environmental Consequences

Direct Impacts: Limiting silvicultural activity to summer and fall eliminates the choice of winter logging on snow, which is an important option for such management options as overstory removal of shelterwoods to protect regeneration and minimize soil disturbance.

The loss of timber resource can result if thermal and hiding cover areas are not logged. Minimizing roads may preclude access to adjacent stands for harvesting.

Indirect Impacts: The concentration of animals on a winter range usually causes heavy browse damage to tree regeneration.

f. Wildlife

Description of the Impacted Environment

Areas which are used by the big game species for winter shelter.

Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

Environmental Consequences

Direct Impacts: The Forest Management Plan recognizes (Section III.D.2.) that big game winter ranges are limited and varied, and therefore are very important to large ungulates. The decision to consult wildlife specialists on all timber sales planned on winter ranges is commendable. However, timber managers should recognize that: 1) On winter ranges where forage is not the limiting factor, logging cannot be used to improve conditions for wintering big game (i.e.

forested areas adjacent to elk grassland winter ranges). 2) Optimal habitat quality for big game animals, and optimal timber production cannot be achieved on a given winter range simultaneously. And 3) Winter ranges do not provide entirely for the nutritional needs of large ungulates, so conservation of stored energy as well as energy intake is important to wintering animals. Thus, human disturbance of wintering animals should be reduced to the lowest possible level, especially in deep snow areas or during winters of above normal snow depths.

Indirect Impacts: None are anticipated.

g. Fisheries

Description of the Impacted Environment

Impacts will be on big game winter range.

Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

Environmental Consequences

Direct Impacts: None except where policy will detract from sound management practice.

Indirect Impacts: No significant impacts.

h. Wilderness

Description of the Impacted Environment

The lower slopes of the Mission Mountains Wilderness serve as elk winter range, but cover a limited area. The majority of lands in the wilderness are not suitable winter range.

Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

Environmental Consequences

Direct Impacts: The loss of winter range through timber harvest on the forest may result in temporary displacement of ungulates to wilderness lands. Following the harvesting activity, if it is designed for winter range specifications identified in the Management Plan, there would be an increase of available winter range, relieving the temporary pressure on the wilderness lands.

i. Recreation

Description of the Impacted Environment

Snow depth is very important in determining the seasonal distribution and survival of deer, elk, and bighorn sheep. These species concentrate during the winter on small tracts that are usually steep, south-facing, slopes at low elevations where snow does not accumulate. Because these sites are also quite dry, there are usually few trees occupying the sites.

Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

Environmental Consequences

Direct Impacts: Maintenance of a sense of priority on big game winter range will reduce potentially negative impacts to populations, thus increasing the probable hunting success rate and opportunities for wildlife observation.

Indirect Impacts: Indirect impacts to recreation are limited in scope because much hunting on the reservation is subsistence rather than recreational. Hunting by non-tribal members is prohibited.

j. Archaeology/Cultural Heritage

Description of the Impacted Environment

All areas of the Reservation are important to big game as winter range.

Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

Environmental Consequences

Direct Impacts: None are anticipated.

Indirect Impacts: None are anticipated.

k. Human and Community Developments

Description of the Impacted Environment

All wildlife areas within the Reservation and within the range of those wildlife populations.

Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

Direct Impacts: There would be no adverse impacts.

Indirect Impacts (Sociological Analysis): No adverse effects would occur.

l. Threatened and Endangered Species

Description of the Impacted Environment

Big game wintering areas on the reservation which are utilized by any of the threatened or endangered species present on the Flathead Indian Reservation.

Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

Environmental Consequences

Direct Impacts: Protection of big game winter ranges from human disturbance during winter may also benefit wintering bald eagles and wolves.

Indirect Impacts: Big game carrion may benefit wolves and bald eagles in winter and grizzly bears in spring. Good populations of wintering big game will provide prey for wolves.

m. Ecological Interrelationships

Description of the Impacted Environment

The impacted areas are those important to big game as winter range.

Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

Environmental Consequences

Direct Impacts: The plan calls for sale-by-sale evaluation of wildlife potential and possible expansion of winter range through partial cuts on south slopes at 5,500 feet elevation.

One problem with maintaining winter range on forested areas is its dependence on periodic fires. A light fire is needed every 15-20 years to stimulate shrub regrowth. If wildfire is excluded as is proposed in the Management Plan, then shrubs grow too tall, so that the tender new shoots are beyond the reach of big game. Areas of decadent shrubs furnish little browse for wintering big game. If areas are to be maintained for wildlife, fire has to be reintroduced on a reasonable frequency, probably through controlled burning.

More research is needed on the frequency of fire needed to maintain nutritious, accessible grass and shrubs. Stark and Steele (1978) showed that fire of the proper intensity (± 570°F to 2 inches in the soil) helps to improve the forage nutritional quality. Any plan to maintain winter browse range must include a fire plan.

Because logging is disruptive to soils and wildlife, logging frequency should be minimized in winter range areas. Large areas that are in contact with winter ranges or nearly so should not be logged all at one time. If roads are essential, they should not be open during late fall or winter.

The plan is workable with some special considerations.

Indirect Impacts: No significant impacts will be realized.

C. Old-Growth Timber Policy

Background: Present policy calls for putting all non-wilderness and inaccessible forest lands under intensive management which requires that all old-growth timber in the commercial forest be managed. Certain wildlife species require old-growth timber (at least as a component within younger stands) for all or part of their life cycle. Some people feel that the present policy will have a negative effect on species requiring the old-growth component and that it should be changed to provide reservation-wide enclaves for these species of wildlife.

a. Geology

Description of the Impacted Environment

This alternative will not impact the geologic, minerologic, water or soil resources of the Reservation. Management plans should be better than adequate to accomodate the wildlife concerns raised in this section.

Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Environmental Consequences

Direct Impacts: No significant impacts will be realized.

Indirect Impacts: No significant impacts will be realized.

b. Surface Hydrology

Description of the Impacted Environment

The impacted environment consists of the old-growth stands having potential as commercial forests on the reservation exclusive of wilderness areas. Impacts will differ according to past fire history, fire ecology of the vegetation, cultural procedures, and cutting and slash disposal practices.

Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Environmental Consequences

Direct Impacts: Principal hydrologic consequences were discussed in Sale Unit Design and Sale Size sections.

The total hydrologic impacts on a watershed are a function of the size of the harvest blocks, the silvicultural prescription in the blocks, and the percentage of the total watershed impacted. The magnitude of the impacts is directly related to the amount of surplus precipitation available for runoff. Duration of the impacts is determined by site productivity or the rate of vegetative regrowth.

Indirect Impacts: No significant impacts.

c. Range

Description of the Impacted Environment

All old-growth forests on the Flathead Indian Reservation that are used for grazing or have potential for grazing.

Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Environmental Consequences

Direct Impacts: Old-growth stands on permanent forest range (group A) may supply valuable forage for livestock, especially stands that are open enough to furnish adequate forage. Cutting of stands in group A should lead to an increase in forage but might cause regeneration problems. Cutting of old-growth stands in other habitats would increase transitory range but may be detrimental for many wildlife species that depend on such stands.

Indirect Impacts: None are anticipated.

d. Soils

Description of the Impacted Environment

The impacted areas are limited acreages of old-growth timber throughout the Reservation but often on bottomland soils. No particular soil series are impacted.

Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Environmental Consequences

Direct Impacts: These areas are not to be preserved intact but are listed for "prime consideratin in scheduling". This is interpreted to mean "harvest as soon as possible." Individual snags or old trees will be left for cavity-nesting birds.

From a soils point of view, this policy excludes the soils and climatic conditions associated with old-growth forests except in wilderness areas. All key soils with old-growth forest do not occur in wilderness areas. Soil developmental processes in the Flathead Indian Reservation are only partly understood, particularly in respect to productivity of old-growth forest where there has been no human intervention. Sound management of reservation soils into the future will require information on forest soil developmental processes that can only be obtained from intact old-growth stands that have never been harvested. Such stands are the "controls" against which we can judge the effects of different silvicultural treatments on soils. Without these controls, we will never be able to understand how young forest soils in this climate are supposed to develop nor what can be done to reduce irreversible adverse impacts from harvest. An old tree here and there does not maintain the leaching and weathering microclimates of an old-growth stand.

A measure that would mitigate the adverse impacts of this policy would be to maintain 5-10 old-growth stands throughout the reservation on soils formed from different parent materials and in different climates. Maintenance means totally neglecting these stands to natural processes including wildfire. These need not exceed 10-15 acres in extent but will be priceless to BIA foresters in the years to come. They will not seriously impact the commercial timber base. Within other units to be logged, scattered old trees would still be left for woodpeckers and cavity-nesting birds. Some old-growth stands have survived because they are on soils too moist to be readily harvested.

Indirect Impacts: The policy neglects the long-term benefits of old-growth stands.

e. Timber and Other Vegetation

Description of the Impacted Environment

All old-growth type stands present on the Flathead Indian Reservation.

Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Environmental Consequences

Direct Impacts: Old-growth stands are typically not growing at all. Usually, mortality is exceeding incremental growth. Hence, silviculturally, the site potential is being wasted.

Whenever merchantable old-growth is left, there is a loss of current value and a long-term loss or reduction of productivity of the site. Additionally, isolated old trees may seed the area with either a species or genetic strain that may be unwanted. Ultimately, these large "leave" trees will inhibit development of the new stand.

Leaving blocks of old-growth provides insect and disease centers and also, as dead fuels accumulate, a fire hazard.

Thus, from a silviculture standpoint, cutting of old-growth stands will have a beneficial effect.

Indirect Impacts: None are expected.

f. Wildlife

Description of the Impacted Environment

All forms of wildlife species present on reservation lands.

Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Environmental Consequences

Direct Impacts: Old-growth stands provide a diversity of cover and forage (in some habitat types). Because of snow intercept by old-growth crowns, wild ungulates are sometimes better able to winter in stands in areas of greater snowfall than is possible in younger forests. Removal of old-growth in these areas will probably lead to locally reduced wintering deer and/or elk populations. Snow intercept benefits deer more than elk or moose. Needs for old-growth timber by other species is less understood and needs further study.

Indirect Impacts: None are anticipated.

g. Fisheries

Description of the Impacted Environment

All commercially available old-growth timber lands within the reservation.

Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Environmental Consequences

Direct Impacts: None except where policy detracts from sound management practice.

Indirect Impacts: No significant impacts.

h. Wilderness

Description of the Impacted Environment

Old-growth stands within and on the tribal Mission Mountains Wilderness land of the Flathead Indian Reservation.

Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Environmental Consequences

Direct Impacts: Certain species of wildlife usually associated with wilderness depend on old-growth timber as habitat. Examples include the golden and bald eagles. Wildlife freely cross the wilderness boundary. As long as provisions are made to preserve some large snags in timber sales contiguous to the tribal wilderness, there should be no significant impact of this management concern on the wilderness resource.

Indirect Impacts: No significant indirect impacts will be realized.

i. Recreation

Description of the Impacted Environment

Old-growth stands are those that have not had a harvest entry and which are commercially harvestable. They are located primarily on the east side of the reservation.

Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Environmental Consequences

Direct Impacts: A policy of elimination of old-growth stands would reduce the opportunities for nature appreciation, interpretation and viewing in areas outside wilderness.

Indirect Impacts: This policy may eliminate using some forested regions of the reservation for education of tribal members concerning natural history.

j. Archaeology/Cultural Heritage

Description of the Impacted Environment

The impacted areas are the old-growth timber stands that have commercial timber value outside of wilderness areas. Some of the trees may be hundreds of years old.

Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Environmental Consequences

Direct Impacts: As mentioned in previous sections, anytime that people are concentrated on an area, and machinery is disturbing the surface, there is a potential for destroying archaeological sites and the cultural heritage value of the area. Such archaeological sites as battle pits, tipi rings, and rock piles are especially vulnerable to disturbance. Some of the old trees may also be "debarked trees" which would be destroyed if harvested.

Indirect Impacts: None are anticipated.

k. Human and Community Developments

Description of the Impacted Environment

Economic and social well-being of the Flathead Indian tribe.

Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Environmental Consequences

Direct Impacts: The essence of the plan is to cut old-growth stands if appreciating fast enough in value. No adverse economic impacts are anticipated.

Indirect Impacts: There may be social benefits of retaining old-growth islands in the managed portion of Flathead Indian Reservation forests. These are mostly aesthetic considerations.

l. Threatened and Endangered Species

Description of the Impacted Environment

All threatened and endangered wildlife species existing on the Flathead Indian Reservation.

Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Environmental Consequences

Direct Impacts: Bald eagles require old-growth trees for nest sites and roosting. Old-growth stands used by eagles should be protected. There will be no significant impact on the peregrine falcon, wolf, and grizzly bear by the retention of old-growth timber.

Indirect Impacts: Old-growth stands provide wintering range for big game in areas of deep snow. This may benefit the recovery of wolves, by increasing the prey base (in both numbers and distribution).

m. Ecological Interrelationships

Description of the Impacted Environment

The impacted areas are small acreages of old-growth timber throughout the reservation, often in more moist ecosystems.

Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Environmental Consequences

Direct Impacts: The Management Plan calls for commercial development of all old-growth stands with scattered snags or older trees to be left for bird habitat.

Ecologically, this plan excludes a valuable resource from future study. The ecosystems that are represented in existing old-growth need to be studied indefinitely. We know little about the ecological processes that will occur in old-growth stands that have never been nor will be influenced by the commercial operations of man. Tree response to diseases, insects, water and nutrient stress, climatic change and long-term air pollution are not known. Only through the maintenance of old-growth stands can such valuable data be obtained. All natural influences should be allowed to operate in these stands, including fire.

The soils section contains recommendations for the number and size of old-growth stands that should be left to natural forces. The stands need not exceed 20-25 acres but should represent different habitat types. Obviously, not all forested ecotypes can be protected in this manner, but 5-10 major ecotypes should be represented as they occur. In many cases, only wet or inaccessible areas still have virgin stands.

Indirect Impacts: Questions that can be answered from the old-growth stands will influence how we manage future stands for stocking level, wildlife, watersheds, mineralization and regeneration. A few old-growth stands will provide a place where Indian people can visit the past and watch a new forest emerge from the ancient forests.

Tree rings not only record climatic conditons on drier sites, but they record air pollution levels such as lead accumulation from auto exhaust. Such long-term records can warn man of dangerous build-up of pollutants.

The small commercial value of these stands is of no importance compared to the research, educational and aesthetic values. The Plan should consider mitigation by leaving some stands.

D. Grazing and Commercial Timber Lands Policy

Background: Grazing has occurred on the reservation since it was established. Grazing use is controlled through a permit system. It is felt by some people that grazing on commercial timber land may be inhibiting regeneration and creating soil compaction problems in some areas. To date, no policy has been formulated to deal with this issue.

a. Geology

Description of the Impacted Environment

No specific studies on the impact of grazing on soils of the Flathead Reservation have been conducted. Only general statements of concern are possible at this time. Clearly, fragile soils or those on steep slope are most sensitive to compaction and accelerated erosion processes. The intensity of grazing activity is also important. Increased erosion rates cause decline in water quality and reduction in regeneration potential of logged sites.

Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Environmental Consequences

Direct Impacts: Compaction of soils dramatically increases erosion rates by increasing the relative ratio of runoff to infiltration. Fragile soils, immature soil formation areas, steep slopes and heavy use areas can all be greatly affected by grazing and overgrazing. Soil disturbance can affect tree regeneration potential as well. It has been estimated that, under some conditions, compaction of soil can increase erosion rates by an order of magnitude.

Indirect Impacts: Long-term impacts of soil compaction can lead to denudation of soil mantle, continued water quality degradation (load, chemistry, turbidity) and reduction in growth of forest stands. Long-term negative effects on fisheries, timber harvest, recreation, and economic return can follow.

b. Surface Hydrology

Description of the Impacted Environment

The impacted environment consists of the entire land area of the Reservation including the Mission Mountains Wilderness, Jocko Primitive Area and the Nine Mile Divide. Impacts will differ according to past fire history, fire ecology of the vegetation, past and present cultural resources, and past and present cutting and slash disposal practices.

Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Environmental Consequences

Direct Impacts: The Plan adequately recognizes the consequences of grazing on surface hydrology (Section III.D.2.). Designation of hydrologically sensitive areas and grazing restriction in those areas would minimize conflicts and degradation of the water resources.

c. Range

Description of the Impacted Environment

The impacted environment includes those commercial timberlands which provide a usable forage resource. Grazing would not be feasible on commercial timberlands with slopes greater than 60%, canopy covers greater than 70%, areas with heavy mechanical barriers (rocks or downed timber), or areas without available water. Roads, timber harvesting and thinning with slash disposal will increase access and the amount of available forage for livestock in commercial forestlands.

Commercial timberlands in groups A and B will supply the greatest amount and quality of forage for livestock. Forested lands in group C become marginal for livestock use, but could still be very important for livestock production following timber harvesting. Group D commercial timberlands would supply some usable livestock forage following timber harvesting (3-20 years) and possibly some grazing value on thinned western larch areas. However, the majority of commercial timberlands in group D should not be considered as valuable grazing lands. Land in groups E, F, and G should be excluded from livestock grazing.

Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Environmental Consequences

Direct Impacts: Proper grazing and timber production are compatible and may be complimentary at larger tree basal areas on the drier habitat types. Herding of livestock may be necessary to achieve "proper use" and reduce damage to tree seedlings. In other instances the installation of fences and other facilities may be required to restrain livestock from sensitive areas. Where livestock concentrate for long periods, damage to seedlings will likely occur.

Forage species should be available on a particular site before cattle are introduced to the area or over-utilization will occur. Compaction of soil should not be a problem if cattle are frequently moved and are not introduced before the soil surface becomes dry in the spring. The forest plan over-stresses the influence of compaction of soil by livestock on timber production. With very minimal riding, compaction would be a problem only on a very small area (riparian sites would be concentration areas and may have short-term compaction problems). Soil compaction through livestock use of an area generally reaches only 2-6 inches into the soil, is generally restricted to the surface two inches, and may be alleviated in 5-8 years after livestock are removed.

Livestock grazing could be beneficial by exposing mineral soil for tree establishment, reducing competition from herbaceous and browse species, which enhances the survival and growth rate of seedlings. In addition, grazing may reduce fire hazards and result in less damage when fires do occur. Livestock/forest interactions have been reviewed by Willard et al. (1983).

Thus, the timing of grazing, amount of available forage, and distribution of livestock are critical factors in determining impact of livestock on a particular site. Riding, herding, fencing, and salting may be necessary to reduce negative impacts of livestock use and increase positive impacts. With proper coordination with the range manager, grazing would have few negative direct impacts on timber production.

Indirect Impacts: The amount of usable forage can be greatly altered by timber management. Coordination between the range manager and timber managers is required to maintain good forage production on each permittee's allotment. If tree seedling damage is occurring on a particular site, the livestock should be removed or else the grazing plan should be adjusted.

d. Soils

Description of the Impacted Environment

The impacted environment includes those commercial timberlands which provide a usable forage resource. Grazing would not be feasible on commercial timberlands with slopes greater than 60%, canopy covers greater than 70%, areas with heavy mechanical barriers (rocks or downed timber) or areas without available water. Roads, timber harvesting and thinning with slash disposal will increase the amount of commercial forest lands available for livestock grazing.

Commercial timberlands included in groups A and B will supply the highest quality forage and the most grazing for domestic livestock. Forested lands in group C are more marginal for livestock use, but the dryer habitat types could still be very important for livestock production, especially following thinning or timber harvesting. Group D commercial timberlands would supply some grazing value following timber harvesting, and the western larch sites may supply forage following thinning or as transitory range. However, group D areas should not be considered as valuable grazing lands. Land in groups E, F, and G should be excluded from livestock grazing.

Grazing on commercial timberlands should be considered as a use of commercial forests. These lands greatly increase the amount of range and allow the livestock producer an area to support the livestock while producing hay on privately-held lands.

Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Environmental Consequences

Direct Impacts: The direct impact of forest grazing by livestock, (primarily cattle on the Reservation) on the soil resource is two-fold: compaction of the soil surface and caving-in and mixing of the banks of stream channels. As cows walk over the soil, they exert about 20 lbs/square inch pressure. This increases the soil density and lowers the porosity, especially the soil macropore porosity. Infiltration is lowered, and the opportunity for overland flow and erosion is increased dramatically.

Animal compaction is not as serious as other forms of compaction. Some types of harvesting equipment exert much greater compactive pressures and, in addition, the vibration of the equipment increases the compaction. These types of compaction extend to much greater soil depths than from grazing animals. The soil will recover much more quickly from grazing compaction than where the impact has extended to considerable depths.

Compaction by whatever source is more serious on fine-textured soils (clay), particularly when wet. Thus, the problem is accentuated in the spring and on wetter sites (poorly drained soils). It is also exacerbated on riparian sites because cows tend to accumulate there. However, alluvial soils in riparian zones are usually medium-textured, not clayey, and are therefore less susceptible to compaction.

In addition to the alteration of the hydrologic cycle previously mentioned, the lowering of the macropore porosity by compaction reduces gaseous interchange and affects nutrient availability.

With sensible control of stock numbers, time of grazing, and animal dispersal, adverse impacts of grazing can be controlled, and no irretrievable and irreversible commitments of soil resource should be noted.

Indirect Impacts: No long-range, cumulative impacts on the soil resource should occur.

e. Timber and Other Vegetation

Description of the Impacted Environment

All timberlands subject to grazing on the Flathead Indian Reservation.

Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Environmental Consequences

Direct Impacts: Reforestation, especially planting, is expensive. Cattle may destroy small seedlings by trampling, rubbing and browsing. Extensive damage may warrant replanting; however, by that time, brush has often grown enough that site preparation is necessary.

Cattle should be kept off plantations until saplings reach above the height of the grasses and forbs used for forage. Once seedlings are large enough, grazing may reduce competing grass vegetation and be a benefit to tree growth. However, animal distribution is critical to keep animals from concentrating and causing soil compaction on areas of high clay content. Cattle may browse on tree seedlings when the forage is dry or dormant.

Indirect Impacts: None are anticipated.

f. Wildlife

Description of the Impacted Environment

All forms of wildlife present of the Flathead Indian Reservation.

Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Environmental Consequences

Direct Impacts: On summer ranges, researchers have found that elk avoid areas used by cattle. Both cattle and elk prefer moist sites. Roads associated with timber harvest provide access for cattle to areas of elk summer range, and thus increase the potential for interactions between elk and cattle.

Elk are further harassed by the periodic presence of herders checking cattle condition or moving them about.

The construction of fences, required to restrain livestock movements, may conflict with accustomed migratory routes of big game animals. Coordination with wildlife biologists will lessen the likelihood of this occurring.

Indirect Impacts: None are anticipated.

g. Fisheries

Description of the Impacted Environment

All commercially available timber lands within the reservation may be impacted.

Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Environmental Consequences

Direct Impacts: Extensive grazing activity may lead to changes in water yield due to soil compaction. These impacts may be minimized by evaluating sites prior to grazing use.

Indirect Impacts: No significant impacts.

h. Wilderness

Description of the Impacted Environment

The forage in the tribal wilderness is utilized primarily by wildlife, with some limited use from recreational stock. The forage resource in the wilderness is not extensive enough to support cattle grazing (Funke and Zacek 1977).

Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Environmental Consequences

Direct Impacts: With several proposed timber sales contiguous to the wilderness boundary, it is likely that following these sales additional acreage would be available to livestock grazing. If grazing occurs on commercial timberlands adjacent to the wilderness boundary, cattle may stray onto wilderness lands and cause severe problems. Cattle compete with elk and deer for forage and with grizzly bears for important bear foods. Cattle may also cause soil disturbance and vegetation destruction.

Indirect Impacts: None.

i. Recreation

Description of the Impacted Environment

The impacted environment includes those commercial timberlands which provide a usable forage resource and which also have recreational value. Generally, grazing is not feasible on commercial timberland with slopes greater than 60%, canopy covers greater than 70%, areas with heavy mechanical barriers or areas without water. Habitat groups A and B supply the best grazing potential for livestock.

Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Environmental Consequences

Direct Impacts: Allowing grazing on forest land having commercial value will have negative consequences to developed or intensive recreational opportunities and potentially slightly negative impacts to dispersed opportunities. Such impacts result from the presence of livestock, range developments, livestock manure and flies.

Indirect Impacts: Indirect impacts may be limited to recreationists selecting other, more desirable locales for experiences. Such locales would not have grazing present.

j. Archaeology/Cultural Heritage

Description of the Impacted Environment

The impacted areas are all timberlands subject to grazing on the Reservation.

Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Environmental Consequences

Direct Impacts: None are anticipated.

Indirect Impacts: None are anticipated.

k. Human and Community Developments

Description of the Impacted Environment

Economic well-being of tribe, members, and related employment.

Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Environmental Consequences

There is too little economic information to infer economic impacts. However, some general statements can be made.

The Flathead Indian Reservation has a total of 51 designated range units which encompass 335,000 acres. Approximately three-fourths of these acres are forested. A majority of the 51 units are permitted to 6 Indian Stockman Associations and to individual Indian stockmen. For many of these stockmen, livestock are their primary source of income. Only a small percentage of these range units are permitted to non-Indian operators or are left ungrazed. Almost all of these range units are permitted for "cow/calf" operations, although other types of livestock operations are allowed.

Direct and Indirect Impacts: Livestock operators may be affected in various ways, depending upon the degree to which use restrictions are imposed. Multiple restrictions may cause the range manager to reduce permitted livestock numbers. Thus, there may be a need for livestock operators to seek alternative pastures which are not readily available nor easily obtainable. Culling of herds is also likely to occur. Careful coordination between resource managers and public involvement is essential to successful policy administration.

1. Threatened and Endangered Species

Description of the Impacted Environment

All threatened and endangered species currently existing on Reservations lands.

Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Environmental Consequences

Direct Impacts: If livestock operators make continual checks on their stock (fences, salt, range readiness), it is possible to harass threatened and endangered species as well as other species, leading to abandonment of the site.

Indirect Impacts: If wolf populations recover, increased use of forested areas by livestock could lead to increased predation by wolves. Grizzly bears may also prey on livestock occasionally (especially sheep and cattle).

m. Ecological Interrelationships

Description of the Impacted Environment

The plan addresses grazing and winter range within forested lands. It divides the land according to habitat types and the capability to produce timber and grass.

Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Environmental Consequences

Direct Impacts: Grazing is an attractive supplemental source of income on timber lands. Grazing is compatible with timber production as long as it is light and casual and does not deplete understory species essential for food for wildlife (such as huckleberries) and does not destroy essential advanced tree reproduction in stands where this is desirable. With increasing emphasis on planting, cattle must be kept off the land until the trees are large enough to survive trampling, browsing and rubbing. One negative aspect of grazing is the inevitable compaction of soil, resulting in poor aeration and decreased tree root depth. Some soils high in clays and/or silts may be safely grazed only at drier times of the year. Heavy cattle use near streams can pollute water and drive away wildlife, as well as destroy vegetation by trampling and bedding down. This can be especially harmful in bear habitat where the riparian vegetation is essential to survival of the animal.

Another negative aspect of grazing is the chance of severe overgrazing on steep lands, resulting in erosion. Most habitat types can support light grazing for at least part of the year. Recent research results (Stark, in press) suggest that understory vegetation, both shrubs and herbs, at dense levels on poorer sites may detract significantly from radial tree growth. If these findings hold up in verification tests, poor to moderate growth sites may benefit slightly from light grazing, particularly if soil compaction is minimized. Some habitat types become so brushy that it is assumed the shrubs are removing water and nutrients needed for maximum tree growth. Careful browsing of goats to reduce brush where the species are not of prime value to native browsers could prove highly beneficial to tree growth. The lack of a market for goat meat is one drawback to their use, but research is needed on their value for mohair production and brush control in the coniferous forest zone. Care must be taken to prevent wild and uncontrolled herds of any domestic grazer or browser and to control their impact on the ecosystem by regulating their length of stay. Sheep can be similarly used, but like goats, must be herded to be effective and to reduce predation. Sheep, unlike goats, cannot be used to control brush in the forest zone.

The plan addresses grazing in commercial forests adequately, but some new methods, with adequate testing, may show promise. Open grassy pine lands are not only aesthetically pleasing, but can be productive with careful management. Many commercial stands have too little usable forage to justify livestock grazing problems and possible adverse impacts.

LITERATURE CITED

Brady, N. C. 1974. The Nature and Properties of Soils. 8th Ed. MacMillan Publishing Co., N.Y. 639 p.

Brown, G. W. 1974. Fish Habitat. In: Environmental effects of forest residue management in the Pacific Northwest. USDA Forest Service, Pacific NW Forest and Range Experiment Sta. Gen. Tech. Rpt. PNW-24. Portland, Oregon.

Bureau of Indian Affairs and Confederated Salish and Kootenai Tribes. 1982. Forest Management Plan 1982-1991, for the Flathead Indian Reservation. Processed.

Cummins, L. K., ed. 1974. Impact Assessment of Forest Land of the Confederated Salish and Kootenai Tribes of the Flathead Reservation, Montana. April, 1974.

Curry, R. and K. Carier. 1980. Erosion and stream channel stability in The Bitterroot River Watershed, Southwestern Montana. IN: Water Quality in the Five Valleys Region, Western Montana. Missoula Co. 208 Water Quality Project. 63 p.

Eron, Z. 1977. Heating effects on forest soil physical properties and subsequent seedling growth. Ph.D. Dissertation. School of Forestry, Univ. of Montana, Missoula. 184 p.

Flathead National Forest. 1982. Summary of the soil, chemical and physical analysis data, Flathead National Forest. ed. Dean Dirucek. Kalispell, Montana.

Harvey, A. E., M. F. Jurgensen and M. J. Larsen. 1979. Role of forest fuels in the biology and management of soil. U.S.D.A. Forest Service, Intermountain Forest and Range Experiment Station. Gen. Tech. Report INT-65, 8 p.

Heinselman, M. C. 1970. The natural role of fire in northern conifer forests. IN: The Role of Fire in the Intermountain West. Intermaountain Fire Research Council, Symposium, Missoula, MT. Oct. 27-29, 1970.

Herman, M. and E. E. Willard. 1977. Peregrine falcon and its habitat. U. S. For. Serv., Region I, Endangered Species Tech. report. 23 pp.

Lolo National Forest. 1972. Interim Publication - Soil Survey of the Nine Mile - St. Regis area, USDA Forest Service and Soil Conservation Service, Missoula, MT.

Miller, M. 1976. Shrub sprouting response to fire in a Douglas-fir/western larch ecosystem. Master's thesis, University of Montana, Missoula.

Minore, D. A. and A. W. Smart and M. E. Dubrasich. 1979. Huckleberry Ecology and Management in the Pacific Northwest. NW Forest and Range Experiment Station, Portland, Oregon. Gen. Tech. Rept. PNW-93. 50 p.

Pfister, R. D., B. L. Kovalchik, S. F. Arno and R. C. Presby. 1977. Forest Habitat Types of Montana. USDA Forest Service, Intermountain Forest and Range Expt. Stn., Ogden, Utah. 174 p.

Soil Conservation Service. 1973. Soil Survey of the Lower Blackfoot Area. Soil Conservation Service, Missoula, MT.

Soil Conservation Service. 1975. Soil Taxonomy. Agric. Handbook No. 436. USDA, 754 p.

Stark, N. and P. Biggam. 1980. Erosion and logging roads. IN: Water Quality in the Five Valleys Region, Western Montana. Missoula Co. 208 Water Quality Project. 121 p.

Stark, N. 1977. Fire and nutrient cycling in a Douglas-fir/larch forest. Ecol. 58(1):16-30.

Stark, N. 1978. Man, Forests and the Biological Life of a Soil. BioTropica 10(1):1-10.

Stark, N. 1982. Soil fertility after logging in the northern Rocky Moutnains. Can. J. of Forest Research. 12(3):679-686.

Stark, N. 1983a. Nutrient content of Western Montana Vegetation. Montana Forest and Conservation Experiment Station. Misc. Publ. No. 14. Missoula, MT.

Stark, N. 1983b. Environmental factors for predicting conifer growth in western Montana. (Submitted. Can. J. Forest Research).

Stark, N. and R. W. Steele. 1977. Nutrient content of forest shrubs following burning. Am. J. Bot. 64(10):1218-1224.

Stark, N., S. Baker, B. Stout and T. Seastedt. 1983. The impact of intensive harvest of lodgepole pine on poor granitic soils. Completion Report to US MAB Program, U. S. State Dept.

Wettersten, R. 1970. Environmental impact of snowmobiling. 1970. International Snowmobiling Congress Proc.

Willard, E. E., D. J. Bedunah and Wendell J. Hann. 1983. Forage and livestock in western Montana. Proc. Management of Second-Growth Forests: The State of Knowledge and Research Needs, School of Forestry, Univ. of Monana. pp. 187-208.

APPENDICES

APPENDIX A	Source Material
APPENDIX B	Soils Found in the Flathead Indian Reservation with Physical and Chemical Limitations
APPENDIX C	Soils Found in the Flathead Indian Reservation with Physical and Chemical Limitations
APPENDIX D	Cross-Referencing of Soil Series Names with the Closest Family and Subgroup used in the New Classification, Flathead Indian Reservation
APPENDIX E	Some Basic Laws Concerning Archaeological and Historical Materials on Federal Lands
APPENDIX F	Specific Sites In and Near Forest Areas Which Could be Endangered with Forestry Connected Activities
APPENDIX G-1	Map of the Reservation Showing Forested Lands, Non-Forested Lands, and Lakes
APPENDIX G-2	Map of the Reservation
APPENDIX G-3	Archaeological Site--Ancient Burial Area
APPENDIX G-4	Archaeological Site--Occupation Site
APPENDIX G-5	Archaeological Site--Pictographs
APPENDIX G-6	Archaeological Site--Battle Pits
APPENDIX G-7	Archaeological Site--Occupation Site
APPENDIX G-8	Archaeological Site--Occupation Site and a Single Tipi Ring
APPENDIX G-9	Archaeological Site--Occupation site
APPENDIX G-10	Archaeological Site--Occupation site
APPENDIX G-11	Archaeological Site--Battle Pits
APPENDIX G-12	Archaeological Site--Battle Pits and Tipi Ring
APPENDIX G-13	Archaeological Site--Battle Pits
APPENDIX G-14	Archaeological Site--Pictograph Panel

Appendices (continued)

APPENDIX G-15 Archaeological Site--Occupation Site

APPENDIX G-16 Archaeological Site--Occupation Site

APPENDIX G-17 Archaeological Site--Rock Piles

APPENDIX H Guide for Locating Proposed Policy for Each Management Concern

APPENDIX A

Source Material Obtainable from B.I.A., Flathead Agency

1. Timber, Tribes and Trust: A History of B.I.A. Forest Management On The Flathead Indian Reservation (1855-1975).
2. Environmental Impact Assessment of the Flathead Indian Reservation Forest Lands
3. Forest Management Plan (1972-1981) Flathead Indian Reservation
4. Flathead Agency, Branch of Forestry Annual Reports
5. Flathead Reservation 1980 Forest Inventory (CFI) Raw Data
6. Sunny Slope Experimental Plot Growth Data
7. Wesley Rickard Report: On Managing the Tribal Timber (1978)
8. B.I.A. Review of Rickard Report
9. Timber Sales Handbook
10. Timber Value Appraisal Handbook
11. Flathead Indian Reservation 1973 Inventory (CFI) Analysis
12. Greenacres, Inc. 1962 Forest Inventory Flathead Reservation
13. Sunny Slope Stocking Plot Studies
14. Forestry Branch Chrono File
15. Code of Federal Regulations (CFR) 25 Indians
16. Bureau of Indian Affairs Manual -- 53 BIAM Forestry
17. BIA Environmental Assessment Handbook -- (i.e. guidelines, statutes)
18. Reforestation Manual
19. Greenhouse Manual
20. Reservation Maps -- (i.e., topo quads, planimetric management activities, etc.)

21. Preliminary Lodgepole Inventory Report

22. Tribal lodgepole Management Guidelines

23. Tribal Ordinance 61A, Permits

24. Post & Pole Yard - General Operations, Organization, Butler Report

25. Flathead Reservation Stand Exam Handbook

26. Tribal Forest Management Enterprise (TFME) Plan of Operation

27. Forest Development Plan (10 year)

28. Harvest Schedule (5 year)

29. Branch of Forestry Management By Objectives (MBO)

30. Mission Mountains Wilderness Management Plan

31. Grizzly Bear Management Plan

32. Flathead Reservation Fuels Management Plan Draft

33. Transportation Plan Draft

34. Branch of Forestry Mission Statement

35. Branch of Forestry Organization Chart

36. Reservation Burning Prescriptions

37. Normal Five Year Fire Plan

38. Reservation Fire Plan

39. Flathead River Basin Bibliography

BIA Contacts

Billings Area Office (FTS 585-6358):

Paul Kipp, Area Forester
Jim Stires, BAO liason Forester
Dave Pennington

Flathead Agency:

Alonzo Spang, Superintendent
Karole Overberg, Administrative Assistant
Ken Dupuis, Forest Manager
Gary Sims, Forester, Portland Area Office

Steve Haglund, Supervisory Forester (Timber Sales)
Rolan Becker, Supervisory Forester (Forest Development)
Russ Davis, Supervisory Forester (Fire Management)
Victor Dupuis, Supervisory Forester (Permits)
Arnie Browning, Supervisory Forester (Presales)
James Claar, Wildlife Biologist
Dennis Clairmont, Range Conservationist
Charles Kaudy, Soil Conservationist
Chris Balstad, Civil Engineer

Tribal Contacts

Tom Pablo, Tribal Council Chairman
Tribal Natural Resources Department
Jim Paro, Department Head
Tom Batridge, Hydrologist
Bob Wheeler, Geologist
Herschel Mays, Recreation
Vic Riggs, Fisheries Biologist
Tribal Forest Management Enterprise (TFME)
George Ducharme, Director

Appendix B. Soils found in the Flathead Indian Reservation with physical and chemical limitations.[1]

Physical Limitations

Group 1 - Sand

- Lake Co.
  - Blanchard
  - Selon
  - Pablo
  - Yellowbay
  - Fluvents
- Missoula Co.
  - Udifluvents
  - Ustifluvents
  - Xerofluvents

Group 2 - Silt

- Lake Co. - Deep Silts
  - Haugan
- Missoula Co.
  - Halfmoon
  - Tarkio
- Silty Glacial Lake Surfaces Over Clay
- Missoula Co.
  - Crow
  - Shooflin
  - Bignell
- Silty surfaces with rocks all andic and andeptic soils (volcanic ash)

Group 3 - Clay

- Deep Heavy Clay Soils
  - Shooflin
  - Crow
  - Bignell
- Modest clay subsoils
  - Lobarg
  - Trapps

Groups 4 and 5 - Gravelly or Rocky Colluvial and Residual Soils

- Lake and Missoula Cos.
  - Felan
  - Holloway
  - Repp
  - Winkler
  - Beeskove
  - Trapps
  - Coerock
  - Mitten
  - Tevis
- Missoula Co.
  - Whitore
- Outwash soils

Groups 4, 5 (continued)

- Missoula and Lake Cos.
  - Totelake
  - Glaciercreek
  - Upsata
  - Yellowbay
  - Courville
  - Winfall
  - Mollman

Group 6 - Thin Soils

- Missoula and Lake Cos.
  - Coerock
  - Sharrott

Group 7 - Slow Drainage

- Clayey Tertiary Soils
- Missoula and Lake Cos.
  - Crow
  - Bignell
  - Shooflin
- Lacustrine Soils
  - Tarkio
  - Halfmoon
- Shallow Cirque Basins and Glacial Potholes
  - Coerock

Group 8 - Fast Drainage

- Outwash Soils
- Missoula Co.
  - Totelake
  - Glaciercreek
  - Upsata
- Lake Co.
  - Blanchard
  - Pablo
  - Yellowbay

Group 9 - Wet Soils

- Lake and Missoula Cos.
  - Muck
  - Borohemists
  - Organic Soils

Group 10 - Seasonal High Water Table

- Lake and Missoula Cos.
  - Alluvial - some
  - Fluvents - some
  - Xerofluvents - some
  - Ustifluvents - some
  - Udifluvents - some

Appendix B (continued).

Group 11 - Steep Phases (to 60, 90%)

- Colluvial and Residual Soils
- Missoula and Lake Cos.
  - Felan
  - Holloway
  - Mitten
  - Tevis
  - Whitore
  - Winkler
  - Trapps
  - Repp
  - Beeskove
  - Tevis
  - Sharrott
- Glacial Soils
  - Waldbillig
  - Coerock
  - Courville

Group 12 - Windthrow Hazard

- Shallow Bedrock
- Missoula and Lake Cos.
  - Sharrott
  - Coerock
- Shallow water table
- Missoula and Lake Cos.
  - Alluvial soils - some
  - Fluvents - some
  - Xerofluvents - some
  - Ustifluvents - some
  - Udifluventssome

Group 13 - Erosion Hazard

- Sandy Outwash (steep portions)
- Lake Co.
  - Blanchard
- Missoula and Lake Cos.
  - Totelake
  - Glaciercreek
- Silty Lacustrine Soils (steep portion)
- Missoula and Lake Cos.
  - Halfmoon
  - Tarkio
- Colluvial and Residual Soils
  - Felan
  - Holloway
  - Repp
  - Winkler
  - Beeskove
  - Trapps
  - Coerock
  - Mitten
  - Tevis

Group 14 - Compaction Potential

- Missoula and Lake Cos.
  - Crow
  - Shooflin
  - Bignell
  - Halfmoon
  - Courville
  - Tarkio

Group 15 - Frost Heaving

No data available

Group 16 - Potential Low Water Holding Capacity

- Outwash
- Missoula and Lake Cos.
  - Glaciercreek
  - Totelake
- Lake Co.
  - Pablo
  - Blanchard
  - Yellowbay
  - Selon
- Shallow
  - Sharrott
  - Coerock (high precipitation zone)
- Colluvial and Residual Soils
  - same as in Group 4

Group 17 - Equipment Limitations

- All steep slopes
- All silty loam surfaces
- All wet or organic surfaces
- All shallow soils
- All soils with abundant surface boulders
- All "problem" subsoils, i.e.: calcareous subsoil, low water-holding capacity subsoil, clayey subsoils
- Silty surfaces and clayey or silty subsoils
  - Shooflin
  - Crow
  - Bignell
  - Halfmoon
  - Tarkio
- Wet soils - See Group 9
- Shallow soils - See Group 6

Group 18 - Roads

All erosive or non-compactable soils, all steep or wet soils, unstable soils (slump potential)

Appendix B (continued).

Group 19 - Cold Soils

- Cold Phases
  - Holloway Cold
  - Felon Cold
  - Waldbillig Cold
  - Coerock
  - Ptarmigan
  - Vasquez
  - McCally
- All Cryic soils as well

Chemical Limitations

Group 20 - Calcareous Topsoil

Small, limited spots of colluvial material with limestone

Group 21 - Calcareous Subsoils

- Limestone Colluvial - Residual Soils
- Missoula and Lake Cos.
  - Repp
  - Beeskove
  - Whitore
  - Felan
  - Mollman
  - Trapps
- Lacustrine Soils
  - Halfmoon
  - Tarkio

Group 22 - pH High for Conifers (pH 8.3)

Similar to Group 21, but not including entire extent of each soil

Group 23 - Acid pH (5.5)

Borohemists - organic
Shooflin
Crow   Some subsoil horizons
Bignell
Coerock   high elev
Holloway, cold   quartzite and
Waldbillig   argillite soils

Group 24 - Low CEC

- Sandy soils, Group 1
- Shallow soils, Group 6
- Subsoils of Most Colluvial Residual Soils
- Missoula and Lake Cos.
  - Holloway
  - Repp
  - Beeskove
  - Winkler
  - Tevis
  - Felan
  - Mitten
  - Courville
  - Whitore

Group 25 - Low Nutrients

- Missoula and Lake Cos.
- Sandy soils - Group 1
- Shallow soils - Group 6
- Most Colluvial and Residual Soils
- Cold, young soils

Group 26 - High Nutrients (other

- Missoula and Lake Cos.
- Some clayey Tertiary Soils
  - Bignell
  - Shooflin
  - Crow
- Some Deep Tills
  - Courville
  - Winfall

---

[1] Lake County Survey and related areas, edited by B. Dutton and N. Stark

Appendix C. Soils found in the Flathead National Forest with physical and chemical limitations.[1]

Physical Limitations

Group 1
Sand
- Alfic usti psamment

Group 2
Silt
- Glossic cryoboralf fsi
- Typic Eutroboralf fsi
- Typic Eutrochrept CoSi.
- Typic Haplaquent SoSi.
- Andic Cryochrept Lo-sk.
- Dystric Cryochrept CoSi
- Andic Cryochrept Lo-sk., surface
- Typic Cryoboralf, Lo-sk, and frigid
- Glossic Eutroboralf, Lo-sk
- Andeptic Cryoboralf Lo-sk, surface
- Andic Dystric Eutrochrept Lo-sk
- Typic Pale Boralf Lo-sk
- Andeptic Cryoboralf Lo-sk
- Andic Dystric Eutrochrept Lo-sk
- Dystric Eutrochrept Med. ov. Lo-sk
- Andeptic Eutroboralf Lo-sk
- Typic Eutroboralf Lo-frigid
- Dystric Eutrochrept:Sa-Sk-fr.
- Entic Cryoandept Med-sk.
- Lithic Cryandept Med.

Group 3
Clay
- Aquic Eutroboralf (cl, frigid)

Group 4
Gravelly
- Bor Saprist, Loamy skel., subsurface
- Andic Cryochrept Lo-sk.
- Typic Cryoboralf, Lo-sk.
- Glossic Eutroboralf, Lo-sk.
- Typic Eutroboralf Lo-sk -some fr.
- Andic Eutrochrept Lo-sk.
- Typic Eutrochrept Lo-sk.
- Andic Dystrochrept Lo-sk.
- Typic Pale Boralf Lo-sk.
- Andeptic Cryoboralf Lo-sk.
- Andic Dystic Eutrochrept Med. ov. Lo-sk.
- Andeptic Eutroboralf Lo-sk.

Group 4 (continued)
Gravelly
- Udic Ustochrept Lo-Sk-fr.
- Andic Cryochrept Lo-sk.
- Typic Eutroboralf CL-Sk-fr.
- Glossoc cryoboralf Lo-sk.
- Andeptic ustrochrept Lo-Sk-fr.
- Entic Cyroandept Med-Sk.

Group 5
Rocky
- No data available

Group 6
Thin Soil
- No data available
- Andic Lithic Cryochrept
- Lithic Ustochrept
- Lithic Andic Cryochrept

Pergellic Lithic Cryorthod

Group 7
Drainage (Slow)
- No data available
- Mostly silts, mostly slowly drained, excedpt for sands, organic soils

Group 8
Drainage (Fast)
- No data available
- Sands or coarse fragment soils low bulk density andic soils, or andeptics

Group 9
Wet Soils
- Little data available-aquic soils
- Aquolls, Aquepts

Group 10
High Watertable
- No data available, except Aquic subgroups

Group 11
Steep Phases 45%
No data available, common to many soils
Tamely - cold
Felan - cold
Holloway - cold
Others

Group 12
Windthrow Hazard
No data available

Group 13
Erosion Hazard
No data available
Mostly silts with low hazard

Group 14
Compaction Potential (Severe)
Andic Cryochrept Lo-sk. (gentle slopes)
Andeptic Cryoboralf Lo-sk. (gentle slopes)
Typic Eutroboralf Cl-Sk-fr. (gentle slopes)

Group 15
Frost Heaving
No data available but many Cryic soils are included
Pergellic Cryorthod
Pergellic Sideric Cryorthod
Pergellic Lithic Cryorthod
Pergellic Boroll

Group 16
Potential Low Water-Holding Capacity
Andic Eutrochrept Lo-Sk.
Andic Dystrochrept Lo-Sk.
Udic Ustrochrepts Lo-Sk.

Group 17
Equipment Limitations
No data available but would include all andic, andeptic, steep, clay or high silt soils

Group 18
Roads

Group 19
Cold Soils
All Cryic and cold soils

Chemical Limitations

Group 20
Calcareous Topsoil
No data available

Group 21
Calcareous Subsoil
Bor Saprist, Loamy Skeletal
Typic Eutroboralf Cl-Sk-fr.
Andeptic Cryoboralf Lo-sk.

Group 22
pH High for Conifers (but not surf)
Glossic Cryoboralf
Typic Eutroboralf
Dystric Cryochrept CoSi
Andeptic Cryochrept, Lo-sk.
Andic Dystrochrept Lo-sk.
Andic Dystric Eutrochrept M. ov. Lo-sk
Dystric Eutrochrept M. ov. Lo-sk
Andeptic Pale Boralf Lo-sk.
Typic Pale Boralf Lo-sk. (some capacity)
Andeptic Cryoboralf, Lo-sk. (some)
Lithic Cryandept (Med.)

Group 24
Low Cation Exchange (5meq/100g)
Andeptic Pale Boralf Lo-sk.

Group 25

Low Nutrients (cold, young)
  Bor Saprist (low phosphorus)
  Glossic Cryoboralf (low N)
  Typic Eutroboralf (P, Fe, low N)
  Typic Eutrochrept (Ca, Si, N)
  Typic Haplaquepts (N, P, Zn)
  Typic Haploquoll Fsi (N)
  Aquic Eutroboralf (N, P)
  Andic Cryochrept (N, Ca, Mg, K)
  Dystric Cryochrept (Ca, Mg, K, N, P)
  Andeptic Cryochrept (Ca, N, Mg, K)
  Typic Cryoboralf (Ca, Mg, P, K, N, not all)
  Andeptic Cryochrept Lo-sk (K, Mg, N)
  Glossic Eutroboralf Lo-sk (K, N, P)
  Andic Eutrochrept Lo-sk (K, N, P)
  Andic Dystrochrept Lo-sk (Ca, Mg, K, N)
  Typic Pale Boralf (N)
  Dystric Eutrochrept (N, K)
  Andeptic Eutroboralf Lo-sk (N)
  Typic Eutroboralf Loamy, frigid (N, K)
  Andeptic Cryoboralf Lo-sk (N)
  Entric Cryoandept Med-sk (Ca, Mg, K)
  Lithic Cryochrept Co-Lo (Ca, Mg, K)
  Lithic Cryoandept (Ca)

Group 26

High Nutrients (other than Ca, Mg)
  Potential problem levels
  Andic Cryochrept Lo-sk (Fe, Mn)
  Typic Cryoboralf Lo-sk (Fe)
  Dystric Eutrochrept Sa-sk-fr (Fe, Zn, Mn, Cu, surface)

---

[1] Source: U. S. Forest Service (1982). Not all of these soils are entirely forest soils. Edited by B. Dutton and N. Stark.

Appendix D. Cross-referencing of soil series names with the closest family and subgroup used in the New Classification, Flathead Indian Reservation.[1]

Soils Series	Family	Subgroup
Fluvial - Glacial - Cold Subalpine Slopes - Cirques		
Tamely	Sa-skeletal	Alfic Andic Cryochrept
Tamely - cold	Sa-skeletal	Alfic Andic Cryochrept
Felan - cold	Lo-skeletal	Andic Cryochrept
Holloway - cold	Lo-skeletal	Andic Cryochrept
Rockland (scree or takes)		
True Fissure	Lo-skeletal	Entic Cryandept
Felan - variant	Lo-skeletal	Andic Cryochrept
Coerock	Lo-skeletal, shallow	Andic Cryochrept
Coerock	Lo-skeletal, shallow	Andic Cryochrept
Buckhouse	Lo-skeletal	Typic Cryandept
Felan - variant	Lo-skeletal	Andic Cryochrept
Holloway	Lo-skeletal	Andic Cryochrept
Coerock	Lo-skeletal, shallow	Andic Cryochrept
Felan	Lo-skeletal	Andic Cryochrept
Coerock	Lo-skeletal, shallow	Andic Cryochrept
Nemote	Sa-skeletal	Typic Ustorthent
Fluvial - Subalpine Belt		
Tamely	Sa-skeletal	Alfic Andic Cryochrept
Holloway	Lo-skeletal	Andic Cryochrept
Felan - variant	Lo-skeletal	Andic Cryochrept
Coerock	Lo-skeletal	Andic Cryochrept
Craddock	Lo-skeletal	Andic Cryochrept
Winkler	Lo-skeletal	Udic Ustochrept
Nemote	Sa-skeletal	Typic Ustochrept
Sharrott	Lo-skeletal, shallow	Lithic Ustochrept
Cold Creek	Lo-skeletal	Typic Eutroboralf
Fluvial Montane Slopes - Basins Belt		
Winkler	Lo-skeletal	Udic Ustochrept
Holloway	Lo-skeletal	Andic Cryochrept
Coerock	Lo-skeletal, shallow	Andic Cryochrept
Drexel	Lo-skeletal	Udic Ustochrept
Craddock	Lo-skeletal	Andic Cryochrept
Sharrott	Lo-skeletal, shallow	Lithic Ustochrept
Cold Creek	Lo-skeletal	Typic Eutroboralf

Appendix D (continued).

Soil Series	Family	Subgroup
Fluvial Lower Montane Slopes, Benches, Terraces, Basins		
Cold Creek	Lo-skeletal	Typic Eutroboralf
Sharrott	Lo-skeletal, shallow	Lithic Ustochrept
Repp	Lo-skeletal	Typic Ustochrept
Yourame	Lo-skeletal	Typic Eutroboralf
Greenough	Fine silty	Typic Eutroboralf
Hagstadt	Lo-skeletal	Udic Ustochrept
Krause	Sa-skeletal	Andic Ustochrept
Martina	Lo-skeletal	Trypic Cryoboralf
Savenac	Fine	Andic Cryoboralf
Entente	Coarse silty	Udic Ustochrept
Tarkio	Fine	Typic Eutroboralf
Half Moon	Fine Silty	Typic Eutroboralf
Winkler	Lo-skeletal	Udic ustochrept
Nemote	Sa-skeletal	Typic Ustochrept
Rockland		
Alluvial, partly forested sandy to clay		Undifferentiated
Alluvial, wet, partly forested sandy to clay		Undifferentiated
Glacial - Alpine		
Alpine Turf, Ptarmigan	Lo-skeletal	Pergellic Cryothod
Alpine Turf, Vasquez	Lo-skeletal	Pergellic Sideric Cryothod
Alpine Turf, McCalley	Lo-skeletal	Pergellic Lithic Cryothod
Wet Cold Basins	Lo-skeletal	Undifferentiated
Coerock	Lo-skeletal, shallow	Andic Lithic Cryochrept
Felan	Lo-skeletal	Andic Cryochrept
Holloway	Lo-skeletal	Andic Cryochrept
Craddock	Lo-skeletal	Andic Cryochrept
Buckhouse	Lo-skeletal	Typic Cryochrept
Glacial Subalpine Drift in Mountains, Valleys		
Felan	Lo-skeletal	Andic Cryochrept
Holloway	Lo-skeletal	Andic Cryochrept
Craddock	Lo-skeletal	Andic Cryochrept
Coerock	Lo-skeletal, shallow	Andic Lithic Cryochrept
Buckhouse	Lo-skeletal	Typic Cryochrept
Sherlock	Lo-skeletal	Andic Cryoboralf
Resner	Sa-skeletal	Andic Cryochrept
Totelake	Lo-skeletal	Udic Ustochrept
Winkler	Lo-skeletal	Udic Ustochrept

Appendix D (continued).

Soil Series	Family	Subgroup
Main Valley Sideslopes - Drift		
Aits	Loamy	Udic Ustochrept
Repp	Lo-skeletal	Typic Ustochrept
Totelake	Lo-skeletal	Udic Ustochrept
Winkler	Lo-skeletal	Udic Ustochrept
Sharrott	Lo-skeletal, shallow	Lithic Ustochrept
Wet Basins, partly forested	Lo-skeletal	Aquept - Aquoll, undifferentiated
Alluvial Basins, partly forested	Lo-skeletal	Fluvents, undiff.
Whitefish	Fine loamy	Glossic Cryoboralf
Worock	Lo-skeletal	Typic Cryoboralf
Skiddoo (Mollman)	Lo-skeletal or coarse loamy	Udic Ustochrept

---

[1] Adopted from Cummins (1974) by B. Dutton. See pp. 7-21 of that publication for general information.

APPENDIX E

SOME BASIC LAWS CONCERNING ARCHAEOLOGICAL AND HISTORICAL MATERIALS ON FEDERAL LANDS

Antiquities Act of 1906: (Public Law 59-209; 16 U.S.C. 431-33)

Provides for the protection of all historic and prehistoric ruins or monuments on Federal lands. Prohibits any excavation or destruction of such antiquities without permission of the Secretary of the Department having jurisdiction. The Act provides authorization by the Secretaries of the Interior, Agriculture and War to give permission to reputable institutions for increasing knowledge and for providing permanent preservation in public museums. It also authorizes the President to declare areas of public lands as National Monuments and to reserve lands for that purpose.

Comment: In a court case there was a question of the meaning of the term "antiquities". Therefore, another Act in 1974 was enacted which was intended to provide further protection for historic and archaeological properties on Federal and Indian Lands by providing for criminal and civil penalties against unauthorized (unpermitted) use and destruction of these properties. The Act also provided for increasing communications and the exchange of information on matters pertaining to the protection of archaeological and historical remains among agencies of the government, the archaeological community, Native Americans, collectors, and the general public. (Archaeological Resources Protection Act of 1979: Public Law 96-95; 16 U.S.C. 470aa.)

Historic Sites Act of 1935: (Public Law 74-292; 16 U.S.C. 461-67)

This Act declared a national policy for the preservation and public use of historic sites, buildings and objects. It gave the Secretary of the Interior authority to make surveys of historic and archaeological sites, and to acquire and preserve historic and archaeological sites. The National Historic Landmarks program was also established under this Act to recommend or designate properties having exceptional value as sites which commemorate or illustrate the history of the United States.

Comment: During this decade, Congress was interested in developing recreation centers and activities as well as stressing historic and prehistoric matters. Thus, excavations and related research were regarded as potentially benefiting to the public in displays, museums, through informational tracts, etc. Funds began to be expended on excavations by the depression-time Works Progress Administration (W.P.A.). After World War II, when the Corps of Engineers and the U.S. Bureau of Reclamation began a huge program of constructing dams, there was a corresponding growth in the study of areas to be inundated for historic and prehistoric remains which would be destroyed. This led to the "salvage archaeology" program of the 1950's in reservoir basins along the Missouri River, Red River (in Texas), the Colorado River, the Columbia River, and along other systems. The procedures were strengthened and reaffirmed by The Reservoir Salvage Act of 1960: (Public Law 86-523; 16 U.S.C. 469-469c).

Reservoir Salvage Act of 1960: (Public Law 86-523; 16 U.S.C. 469-469c)

This act provides for the preservation of historical and archaeological data (including relics and specimens) which might otherwise be irreparably lost or destroyed as the result of activities connected with the construction or flooding of a dam by a Federal agency or a private entity holding a license issued by a Federal agency. The Secretary of the Interior is to be notified of the proposed area of construction, and the area to be inundated by the construction. The Secretary is directed to cause historical and archaeological studies to be made and data and specimens of exceptional significance are to be saved. Ownership of specimens and data obtained, along with repositories, were to be determined by the Secretary in consultation with Federal and state agencies, and with various educational and scientific organizations, as well as with qualified individuals.

National Historic Preservation Act of 1966: (Public Law 89-665; 16 U.S.C. 470-470m as amended 16 U.S.C. 460b, 470i, 4701-470n)

This act provides for the expansion of research and recommendations to a National Register of Historic Places, including districts, sites, buildings, and objects significant in American history, architecture, archaeology, and culture. It also provides for the organization and procedural matters for An Advisory Council On Historic Preservation.

National Environmental Policy Act: (Public Law 91-190 U.S.C. 4321 Et Seq. 1969)

This act requires an impact statement be made by any Federal agency planning an action that would affect the quality of human environment. The environment would involve cultural (including archaeological) as well as natural resources. Impact statements are required before the undertakings are implemented.

Executive Order 11593: Protection and Enhancement of the Cultural Environment, (16 U.S.C. 470 May 13, 1971. Richard Nixon)

Federal agencies are directed in this order to survey, record, inventory, and evaluate cultural resources and properties, and to nominate all significant sites to the National Register. These properties are to be maintained and preserved by these agencies. If agency action necessitates destroying a site, then the records and objects recovered from sites would be deposited in the Library of Congress (in case of records) or in an institution prepared to house collections. Some types of records will be housed by the Historic American Engineering Record. A July, 1973 deadline was specified in the Order, but funds were not appropriated by Congress to implement the study, and even at this date (1983), the study process is very incomplete.

Archaeological and Historic Preservation Act of 1974: (Public Law 93-291; 16 U.S.C. 460)

This act is one of the more important pieces of legislation today which concerns cultural environmental matters. In a sense, it amends the Reservoir Salvage Act of 1960 (Public Law 86-523) and expands it to include all Federally financed construction or similar projects. There are at least four provisions:

1. On Federal construction projects, whether licensed or not, it makes the Federal agency financing the project responsible for damage or losses of scientific, prehistoric, historic and archaeological resources once the project is authorized.

2. Makes the Secretary of the Interior responsible for coordinating and organizing relatively uniform Federal policies and programs in implementing resource programs.

3. Authorized agencies to seek funds to cover the costs of recovery, preservation, or recovery of information in the programs.

4. Allowed the transfer of up to 1% of funds from a project to cover the costs of a program.

American Indian Religious Freedom Act: (August 1, 1978. Public Law 95-341. Res 102)

This document may have some bearing, at times, on forestry practices. The act protects the right of Native Americans to their forms of religious expression and beliefs, but it could also relate to sites in forests which involve religion, or have done so in the past. Thus, vision quest sites, pictograph panels, "Blue Jay" (or Winter Spirit) ceremonial grounds, and even sweat lodges could be regarded as inviolate.

Archaeological Resources Protection Act, October 1979: (Public Law 96-95, U.S.C. 470aa)

This act adds more protection to historic and archaeological properties on Federal lands and on Indian lands. It increases penalties for violations, or for unauthorized uses of the sites. It also is designed to improve communications between governmental agencies, professional archaeologists and agencies, Native Americans, collectors, and even the general public.

NOTE: The coordination of archaeological, historical and cultural activities between all agencies is the task of:

The Interagency Archaeological Services (IAS)
National Park Service
U. S. Department of the Interior

APPENDIX F

SPECIFIC SITES IN AND NEAR FOREST AREAS WHICH COULD BE ENDANGERED WITH FORESTRY CONNECTED ACTIVITIES

All known sites on the entire reservation occupied by the Confederated Salish and Kootenai tribes have been compiled with brief descriptions and locations. The information was previously submitted to the Tribal Council, and included sites not involved in forestry operations.

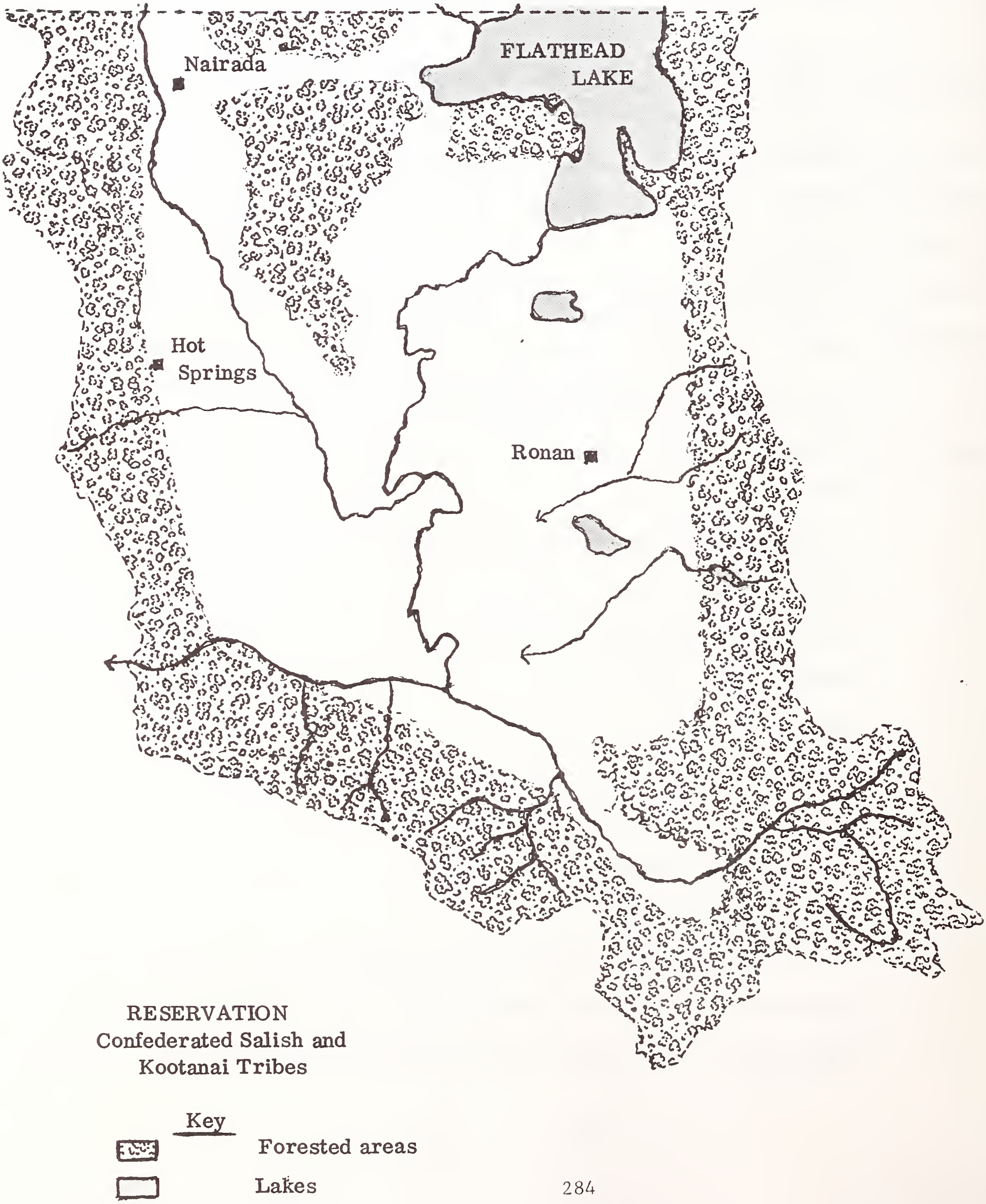
Sites which might be endangered, and which are already known to exist, are described and listed in this section. These are arranged according to locations in Townships, Ranges, Sections, and quarter sections. Further detail is provided with sketch maps and descriptions.

Most of the known sites on the reservation have been discovered on lowlands, in open spaces such as in the valleys, and along river courses. These areas are where most of the people in modern times have worked, lived, and played, and in the process have observed these relics of the past. Consequently, the mountainous areas and forests have been given less attention in the search for prehistoric and historic remains. Therefore, Cultural Resources Management must be aware that a search should be included before any changes are contemplated in the forested areas.

The descriptions of some of the sites known on the reservation should help future investigators to anticipate where they might be located, and to know what types of sites may be found in the vicinity.

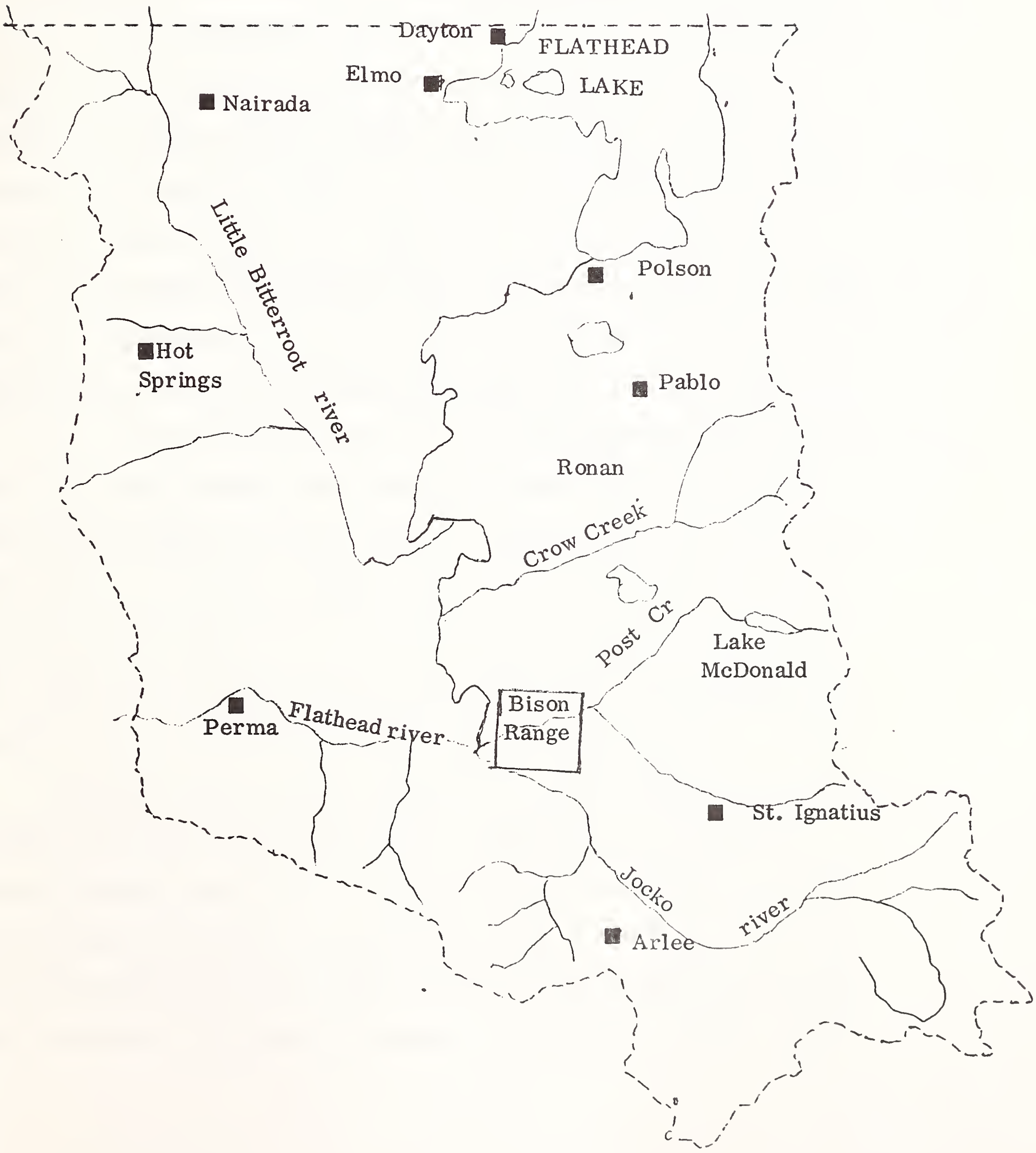
APPENDIX G-1

MAP OF THE RESERVATION SHOWING FORESTED LANDS, NON-FORESTED LANDS, AND LAKES



APPENDIX G-2

MAP OF THE RESERVATION



APPENDIX G-3

ARCHAEOLOGICAL SITE

TYPE OF SITE: Ancient Burial Area SITE NO. 24LA1004

COUNTY: Lake VICINITY: Dayton

At least four prehistoric skeletons have been found in this vicinity where a mountain ridge extends from the west into Flathead Lake south of Dayton, Montana. These were found between the shoreline to an elevation about 100 feet above the shoreline where there are some small rock outcroppings. One skeleton was found within a talus slope about 30 feet above the lake level. All were discovered over the years during construction operations connected with road building, or home site improvements.

There were no distinctive surface signs such as rock piles, poles extending out of the ground, or other indications that burials were located at these places. All were somewhat accidental in their discovery. The information about this burial was obtained from persons who witnessed the find (about 1942 when the discovery was made). The purpose of this description is to inform field workers in the forests about the possible presence of burials in areas where they work.

According to the landowner, who was interviewed about the finds in 1950, two skeletons were first found. The landowner remarked that Dr. Harry H. Turney-High, from the University of Montana, identified one skeleton as female, and the other as male. Both had been buried in a flexed (doubled up) position. Immediately above the skeletons a fire hearth had been built which partially burned some of the bones, but some other important bones were missing entirely. From this evidence, it is clear that these ancient burials were "secondary" in type. That is, during the times when these bodies were initially handled after a funeral, they were interred above ground either on a scaffold, or directly on the ground. Possibly, too, they could have been initially placed among tree branches. A few years later, these remains were gathered and reinterred in the ground in the manner described for this burial site. A few artifacts accompanied these secondary burials proving their antiquity since the tools were all made of stone. Dr. Turney-High said that red ochre was placed near the face of the female, causing her bones which were immediately adjoining to become reddened.

APPENDIX G-4

ARCHAEOLOGICAL SITE

TYPE OF SITE: Occupation Site SITE NO. 24LA504

DESCRIPTION: Specimens representing several horizons of ancient cultures over thousands of years have been found around Lake McDonald. Even in recent times local collectors have picked up points, scrapers, knives, chips and flakes. The largest known collection made here by an amateur was donated to the National Bison Range.

The dam considerably enlarged the size of an earlier natural lake in this area. About 1906, an Indian camp was photographed on the lakeside before the dam was constructed. A large glacial morraine is located downstream, and was responsible for forming the lake behind it.

The site is at the edge of tribal forests, and there is some danger of further losses and damage if new roads or recreation areas are constructed in the vicinity, or if timber yards are developed.

APPENDIX G-5

ARCHAEOLOGICAL SITE

TYPE OF SITE: Pictographs SITE NO. 24LA1013

COUNTY: Lake VICINITY: Dayton-Elmo

DESCRIPTION: This is a small panel of pictographs, painted in red.

IMPACT RISK: Care should be taken if logging is contemplated in this area, whether it is being done by reservation authorities or by private firms.

APPENDIX G-6

ARCHAEOLOGICAL SITE

TYPE OF SITE: Battle Pits SITE NO. 24LA1016

COUNTY: Lake VICINITY: Elmo

DESCRIPTION: The pits here are 6-8 feet in diameter, and are in a talus slope about 50 feet north of a dirt road which serves this area. These three pits are so close to each other that they virtually join together.

Reference: Thain White, "The Battle Pits of the Koyokees." Anthropology and Sociology Papers, No. 10. University of Montana, 1952. p. 9.

IMPACT RISK: Caution if nearby mountains are logged. Changes in access roads could endanger them.

APPENDIX G-7

ARCHAEOLOGICAL SITE

TYPE OF SITE: Occupation Site SITE NO. 24LA1028

COUNTY: Lake VICINITY: Ronan (west)

DESCRIPTION: Lithic materials are scattered along a low river terrace on the north side of the Flathead River. The materials are only found on the small openings between moderately heavy ground cover. A few scattered flakes have been found west of the main site.

The site covers an area about 50 yards wide. Testing shows that it does not extend more than 1-3 inches in depth. Flakes are of basalt, chert, and silicates.

The plant life in this vicinity consists of sage brush, other types of brush, and scattered pine trees. Logging, even on a small scale, could obliterate the site if care is not taken to prevent damage with the operation of trucks, dozers, and other machines.

APPENDIX G-8

ARCHAEOLOGICAL SITE

TYPE OF SITE: Occupation Site and a Single Tipi Ring SITE NO. 24LA1032

COUNTY: Lake VICINITY: West of Ronan

DESCRIPTION: The site extends for nearly 200 yards along the river. Evidently it was a habitation site. The depth of the deposits here, however, is shallow extending from the present surface of the ground only to a depth of three inches. Occupation is demonstrated by the presence of fire cracked rocks such as those used in fire hearths, plus stone projectile points, and stone flakes. Most evidences of the occupation are on a river terrace about 15 feet above the stream itself. There is also one well defined "tipi ring" or circle of rocks on the site.

The tipi ring is made up of a circle of stones numbering 120 in all. Each stone measures from eight to ten inches in diameter. The total ring varies in diameter from 15-16 feet. In the center is an unusual smaller ring consisting of 13 stones arranged in a small circle. Fire-cracked rocks, and some stone flakes and chips were found in the vicinity of this ring.

IMPACT RISKS: There is some risk to this site if care is not taken when trees scattered throughout the vicinity are harvested. Special care should be taken to preserve this rare tipi ring.

APPENDIX G-9

ARCHAEOLOGICAL SITE

TYPE OF SITE: Occupation Site SITE NO. 24LA1042

COUNTY: Lake VICINITY: Buffalo Bridge Area Flathead River west of Ronan

DESCRIPTION: The site is in an eroded clay area just west of the corral. It appears to have had light use in past time as an occupation area. Evidences are basalt flakes, and flakes from other stones. One large stone blade was also found.

IMPACT RISK: Limited, but some minor logging could cause some damage through access to tribal lands and timbers along the river where the trees are located.

APPENDIX G-10

ARCHAEOLOGICAL SITE

TYPE OF SITE: Occupation Site SITE NO. 24LA1047

COUNTY: Lake VICINITY: Flathead Lake

DESCRIPTION: This site could be one of the more important occupation areas on Flathead Lake, and records of it could be useful to the tribes for many years in legal cases. It also should have considerable historical value in the future. Hundreds of points, drills, scrapers, knife blades, grooved stone mauls, conical shaped pestles and other specimens have been picked up here by local collectors. (These artifacts are actually tribal property, but the removal of these artifacts has been tolerated by tribal authorities.) Most of the materials used in the stone tools is chert, but there are also some specimens of basalt. Both side-notched type of points are represented in the collections, and this fact alone indicates their recency, perhaps dating from 1400 A.D. to about 1800 A.D. The shoreline, incidently, has a growth of deciduous trees which extends for nearly 400 yards, north and south, along the beachline. Besides tools and implements, flakes and chips, there are fire-cracked rocks which attest to fire hearths and root-roasting pits having once been used here. Perhaps some of these hearths could have also been from the use of sweat lodges.

IMPACT RISK: Very high since it is threatened with immediate real estate "development," including dredging. No such work should be permitted without a salvage archaeological project preceding disturbance. Federal laws could be used to enforce the effort. There could be older sites in the timbered areas to the east of the shoreline, at higher elevations above the lake on sites now covered with brush and trees. Older materials are found on more ancient Flathead Lake shorelines. Therefore, any logging operations in this vicinity should be preceded with an examination for locating these sites.

APPENDIX G-11

ARCHAEOLOGICAL SITE

TYPE OF SITE: Battle Pits SITE NO. 24FH1001

COUNTY: Flathead VICINITY: West of Elmo

DESCRIPTION: The battle pits and one interconnecting trench are now about 2 1/2 feet in depth. According to a Kootenai chief, Baptiste Mathias, who was born in 1876, these pits were somewhat deeper during the 1870's, even if one allowed for his increase in stature when he reached adulthood.

The first pit on the north end of the deposit is about 15 feet in diameter. About 40 yards up the canyon, but in the same rock detritus, there are three more pits which, in this case, are connected with a trench extending east and west. The pit on the east terminus is five feet in diameter while the one on the west end is 12 feet across. A third pit adjoins the western end terminal pit, but it is only 10 feet in diameter. Very little vegetation grows on the rocks, but some bushes and pines have succeeded in establishing root systems here.

A few very large rocks, weighing several hundred pounds each are in some of these pits. Thus, it does not seem likely that these pits could have been the remains of an ancient type of pithouse structure. Some displaced rocks in the bottom of the pits seem to be the result of unauthroized digging by amateur collectors. The rims of some of the better pits, however, show evidences that crude walls had been made of undressed stones for the purpose of extending the depth of the interior.

COMMENTS: This site, perhaps, is one of the finest examples of battle pits, or "Koyokee" Pits as the Kootenai call them. (The term "Koyokee" is a Kootenai word for some of their predecessors in the region, and many of these pits are attributed to them.)

If the tribes on the reservation wanted to develop tourism, this might be considered as one of their better historic sites to present to the public. The fact that an interconnecting trench is present makes them especially interesting and unusual. Usually, pits were hurriedly made as a defensive tactic, and were used for very short periods of time. Thus, they appear in many shapes and sizes.

IMPACT RISK: No danger if the present road right-of-way to the mountain forests is kept, and if forestry or other projects do not disturb the site.

APPENDIX G-12

ARCHAEOLOGICAL SITE

TYPE OF SITE: Battle Pits and Tipi Rings SITE NO. 24FH1002

COUNTY: Flathead VICINITY: Elmo

DESCRIPTION: The tipi rings or rock circles were very simple in form. The diameters of the circles were relatively small. Generally, the cluster extended in a single line along the edge of a dry wash in The Big Draw, and were roughly east to west in direction.

COMMENTS: Some risks of loss through human activities. At the present time, there seems to be little risk from forestry operations, although timber lies in the mountains to the north. Unless roads are built across the area, or other logging facilities are placed here, there should be little impact risk.

APPENDIX G-13

ARCHAEOLOGICAL SITE

TYPE OF SITE: Battle Pits SITE NO. 24FH1003

COUNTY: Flathead VICINITY: Nairada

DESCRIPTION: Possibly there are two or three pits here. During 1940, Mr. Thain White dug a small test trench in Pit No. 2, but nothing was found in it. It did show signs of having been made by humans. Mose Mathias, a Kootenai, told him that at one time some skeletons were found near "The Martin Mine," several miles above these pits, but the information has never been confirmed from other sources.

There are some man-scarred trees located nearby indicating the probability that once an occupation site was located in Hog Heaven. Trees were once debarked by all of the Indians in western Montana during the spring when the sap was running. The sap was regarded as a delicacy. Thain White reports that a few artifacts have been found in Hog Heaven. Site 24FH1003, however, is near the road to Hog Heaven, but is not in the basin itself.

IMPACT RISK: Caution should be used if the present road is reconstructed across the site. Otherwise, most of the risk is from private collectors who might believe they can find "relics" in the pits for their collections.

(Some of the data on "Battle Pits" are from: Thain White, Battle Pits of the Koyokees, Anthropology and Sociology Papers, No. 10. University of Montana, Missoula, 1952. Reprinted as: Flathead Lake, Lookout Museum Papers No. 7. Lakeside, Montana.)

APPENDIX G-14

ARCHAEOLOGICAL SITE

TYPE OF SITE: Pictograph Panel SITE NO. 24SA1019

COUNTY: Sanders VICINITY: Perma

DESCRIPTION: There are actually two panels in the vicinity, one considerably more prominent than the other. The major panel has been frequently publicized in newspaper releases since there are some local people who have attempted to have the site set aside as a special public monument. In the meantime, they are deteriorating through the ravages of time, and especially through vandalism.

The pictographs were probably placed on the panel by young men seeking a vision and spiritual helper. Figures denote the name of the individual in pictograph form, and lines and circles denote the days that person devoted to the quest. Thus, the panels increased in numbers or size over years of use. Probably, they are Pend d'Oreille Indian in origin.

The drawings are painted in red and consist of lines, animals, and small circles.

IMPACT RISK: The pictographs are on tribal lands leased to a tribal member. They could attract public interest, but even now some vandalism has caused damage to them. Logging operations in the immediate vicinity would probably not harm them, but improvements to the campground might attract more people, and only a few of them might be sufficient to cause more destruction.

APPENDIX G-15

ARCHAEOLOGICAL SITE

TYPE OF SITE: Occupation Site SITE NO. 24SA1030

COUNTY: Sanders VICINITY: Ronan (west)

DESCRIPTION: The sites consist of a heavy concentration of lithic materials on the flats at the confluence of the two rivers. Flakes and artifacts have been found here by unidentified collectors. Fire-cracked rocks attest to the strong probability that root-roasting pits were placed here too. The site extends for 350 yards along both sides of the Little Bitterroot River, and ranges from 3-6 inches in depth in some places. It extends for about 1/2 mile along the river course.

Aspens and pines are nearby, along with chokecherry (Prunus virginiana) bushes, grasses, and willows (Salix spp.). Specimens consist of projectile points, some made of obsidian and chert.

IMPACT RISK: Some danger exists from road building, plowing, or dam buil- ding. There could be some minor damage from small logging operations if conducted nearby.

APPENDIX G-16

ARCHAEOLOGICAL SITE

TYPE OF SITE: Occupation Site SITE NO. 24SA1031

COUNTY: Sanders VICINITY: Ronan

DESCRIPTION: The site consists of scattered lithic flakes of chert, basalt, and siltstone. They are found on a small flat on the south side of the Little Bitterroot River. Flakes are particularly common where a clay layer has been exposed through erosion. It is a minor site, but any related road building or other construction work, plowing, or vandalism could destroy it. Such sites have value to archaeology because they give clues to ancient population densities, demographic data, camping conditions and camp sizes, etc. The lithic materials are scattered up and down the Little Bitterroot River for about 100 yards and in a band about 50 yard wide.

IMPACT RISK: A minor site. Some risk of damage if roads are rerouted across it, or if access roads to timber are planned across the site. Such roads, however, could easily be rerouted.

APPENDIX G-17

ARCHAEOLOGICAL SITE

TYPE OF SITE: Rock Piles

SITE NO. 24SA1034

COUNTY: Sanders

VICINITY: Sloan's Bridge
(west of Ronan)

DESCRIPTION: The site consists of rock piles made of natural, or undressed stones, and are located along the ridge crest. One pile is apparently part of a wall rather than a mere pile, and is partially collapsed. There are four or five other piles, and they seem to have been man made.

IMPACT RISK: With proper care, there should be no risk from logging operations. There is some risk from local collectors who may think these are burial sites, and may contain relics for their collections. Actually, rock piles in western Montana rarely are connected with burials. (Usually, they were ancient places where travelers tossed stones as offerings to their guardian spirits as they passed by. The partial rock wall could have been part of an eagle-catching pit.)

APPENDIX H

Guide for Locating the Proposed Policy for Each Management Concern

Page No.

I. Fire Management Program 95

  A. Fire Suppression Policy 95

    1. Proposed Alternative (No Action Alternative): continue present policy, i.e., rapid control of all destructive wildfires.

II. Timber Sale Program 117

  A. Sale Size 117

    1. Proposed Alternative (No Action Alternative): Continue present policy, i.e., most sales will range between 2-10 MMBF, with occasional sales to 20 MMBF.

  B. Timber Sale Unit Design and Priority Policy 131

    1. Proposed Alternative (No Action Alternative): Timber Sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources

III. Silvicultural Program 144

  A. Christmas Tree Cutting Policy 144

    1. Proposed Alternative (No Action Alternative): Keep present policy of unregulated Christmas tree harvesting.

  B. Precommercial Thinning Treatment Policy 156

    1. Proposed Alternative: Set treatment priorities/base site selection on site quality, and vary thinning prescription to obtain optimum site-specific stocking level. Lift all constraints on treatment methodology.

Page No.

C. Even-Aged Block Size Policy 168

1. Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seed tree block size to an average of 10-20 acres, except where constrained by visual objectives.

D. Mistletoe Control Policy 179

1. Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years.

E. Lodgepole Pine Management Policy 190

1. Proposed Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resource.

F. Marginally Productive Sites Policy 204

1. Proposed Alternative: Identify lands with productive capabilities of less and 20 ft.^{3}/A/yr. and de-emphasize timber management.

IV. Other Resources 216

A. Stream Reserve Corridor Policy 216

1. Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

B. Big Game Winter Range 227

1. Proposed Alternative (No Action Alternative): Delineate important winter range locations, in consultation with wildlife specialists, for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range.

C. Old-Growth Timber Policy 237

1. Proposed Alternative (No Action Alternative): Continue present policy of cutting all old-growth stands outside wilderness or inaccessible areas.

Page No.

D. Grazing and Commercial Timber Lands Policy 248

1. Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop use restrictions to benefit forage and timber.

Part 3

ALTERNATIVES

ALTERNATIVES

INTRODUCTION

During 1982 alternatives were developed for each of 24 management concerns identified by the scoping committee. This process is described on page 5 of the E.A. Due to funding constraints, the contract with the University of Montana to prepare the EA only required 13 management concerns be addressed. Also, the contract only required the University to address the proposed alternative (policy stated in the draft forest management plan). When the draft E.A. was reviewed by the Portland Area Office in January 1984, the reviewers concluded that two additional concerns, Prescribed Use of Fire and Forest Roads, be addressed. The review team also concluded that additional alternatives must be addressed in the E.A. This section, written by B.I.A. Flathead Agency staff, contains discussion of alternatives and management concerns not addressed by the University scientists.

The Proposed Alternative is a concise statement of proposed policy for the 1982-1991 Forest Management Plan. For further information on the proposed alternative the reader should refer to the management plan. The No Action Alternative is current policy as established by the 1972 Forest Management Plan. Where no policy change is proposed, the No Action and Proposed Alternatives are the same.

I. Fire Management Program

A. Fire Suppression

1. Alternative 1. Proposed/No Action Alternative: Keep present policy, i.e., rapid control of all destructive wildfires. See page 95.

2. Alternative 2. Develop fire plans for designated areas allowing unscheduled ignitions (lightning) to burn under preplanned criteria.

   Presently a Prescribed Fire Plan is being completed by Systems for Environmental Management, (S.E.M.) for the Mission Mountain Wilderness, subject to Tribal Council approval in FY 1985.

   Environmental Consequences

   a. Vegetation and Timber

      (1) Direct Impacts. Implementing a Prescribed Fire Plan for a designated area will have definite direct impacts on vegetation patterns. Fire will recycle vegetation creating a mixture of successional stages increasing landscape diversity. Fire will also clean up fallen timber, infected vegetation, and rejuvenate decadent vegetation.

      (2) Indirect Impacts. The exclusion of fire has more of an indirect impact on forest fuels than fire itself, natural fuels accumulate creating potential hazardous fire scenarios that otherwise wouldn't have occurred.

   b. Wildlife

      (1) Direct Impacts. Fire resulting in changes of vegetation composition and density will generally benefit wildlife species, especially those preferring early successional plant communities. Deer, elk, grizzly bear, and black bear will most likely benefit from fire where cover is still available for hiding.

      (2) Indirect Impacts. Indirect impacts are easier to describe in terms of fire exclusion, with past rapid control of wildfires, the creation of early foraging vegetation has been reduced.

   c. Watershed

      (1) Direct Impacts. It is unlikely that fires allowed to burn under an approved Fire Plan would cause any long-term adverse impacts on watershed.

      (2) Indirect Impacts. A large fire might lead to soil erosion causing increased water and sediment yields.

d. Air Quality

(1) Direct Impacts. Smoke and particulate matter will have an impact on air quality both within and outside a Prescribed Fire Management area; however, based on normal weather patterns during lightning occurrence season, smoke can be expected to create minimal airshed pollution.

(2) Indirect Impacts. None are anticipated.

B. Prescribed Use of Fire (Scheduled Ignition)

1. Alternative 1. Proposed/No Action Alternative: Maintain present policy of prescriptive use of fire to treat activity and natural fuels for hazard reduction, silvicultural objectives, wildlife habitat improvement, and aesthetics.

Environmental Consequences

a. Vegetation and Timber

(1) Direct Impacts. Maintaining the present "prescribed use of fire" practices will benefit timber and related resources. Vegetative resources such as shrubs, forbes and grasses will benefit in many instances with the use of prescribed fire. Nutrient recycling is also maintained with prescribed fire.

(2) Indirect Impacts. Under fire exclusion natural fuels accumulate in many of the forest habitat types found in western Montana. The combination of activity and natural fuel accumulations with the exclusion of prescribed fire create fire behavior potentials that would likely destroy the timber resource.

b. Wildlife

(1) Direct Impacts. Generally, prescribed use of fire will favor some species of wildlife by regenerating decadent browse species. It may also improve game movement in areas with high activity fuel accumulation, example, clearcuts.

(2) Indirect Impacts. The indirect impacts of prescribed fire wildlife are similar to the statement in Wildland Fire Suppression Policy. (Wildlife).

c. Watershed

(1) Direct Impacts. It is unlikely that the "scheduled use" of prescribed fire will cause any long-term adverse impacts on watershed.

(2) Indirect Impacts. An escape prescribed fires reaching large acreage could lead to soil erosion causing increased water and sediment yields.

d. Air Quality

(1) Direct Impacts. Smoke from prescribed burning directly effects the atmosphere causing visibility problems, increased particulate levels, etc.

(2) Indirect Impacts. Public concerns is the single most important factor resulting from prescribed burning smoke. Increasing burning backlogs and public awareness has led to a very important concern for public land managers involved with prescribed fire.

2. Alternative 2. Reduce or eliminate the prescribed use of fire.

Environmental Consequences

a. Vegetation and Timber

(1) Direct Impacts. Reducing or eliminating prescribed fire will have a negative impact on the forest base.

(2) Indirect Impacts. The exclusion of fire will decrease diversity. Increased fuel loadings will result.

b. Wildlife

(1) Direct Impacts. The reduction or elimination of prescribed fire will reduce the forage for wildlife.

c. Airshed

(1) Direct Impacts. Less impact on the airshed will result with the reduction or elimination of prescribed fire.

(2) Indirect Impacts. Less public concern will result.

II. Timber Sale Program

A. Sale Size

1. Alternative 1. Proposed/No Action Alternative: Continue present policy, i.e., most sales will range between 2-10 MMBF with occasional sales to 20 MMBF. See page 117.

2. Alternative 2. Increase average sale size to 12-25 MMBF. This alternative emphasizes efficiency in preparing the annual allowable cut for sale by providing a relatively high timber volume for a given amount of sale preparation effort. Sales of this size generally cover a large area and require 3 or 4 years to log. Large sales are often complex sales requiring a variety of logging and silvicultural methods.

Environmental Consequences

(1) Direct Impacts. Increasing average sale size results in the preparation of more timber volume for a given amount of sale preparation effort. Most of the gains in efficiency are in the areas of cruising, report writing, contract preparation and appraisal. Timber marking, unit layout, and sale preparation generally require the same amount of efforts per unit of volume as small sales. Larger and longer term sales result in increased risk to the purchaser. As a result of the recent recession, the surviving members of the timber industry are reluctant to speculate and bid on long term sales. As long as interest rates remain high, purchasers will avoid buying a large timber inventory.

Large sales permit amoritization of fixed development costs over a larger volume of timber. Consequently, it is possible to do more high quality development or receive higher stumpage than from small sales.

Larger average sale size could lead to decreased competition for timber as fewer sales would be available. This adverse impact could be mitigated by providing enough small sales in addition to large sales to supply more purchasers and maintain competition.

Large sales are generally more favorable for big game than small sales for a given volume of timber harvest. The reason for this is large sales confine harvest activities to fewer drainages and therefore there is less disturbance and displacement of big game. This is especially true if large sales are completed in three years or less.

Timber sale design, timing, and type of harvest have more impact on non-timber resources than sale size per se. For example, several small sales in one drainage could easily have a greater combined impact on the watershed than a single large sale in the same drainage.

(2) Indirect Impacts. Larger sale size would result in fewer small purchasers buying timber sales. Since Indian loggers buy only small sales, increasing sale size would adversely affect Indian loggers unless some small sales were also provided.

As purchaser risk increases, bid rates for timber decrease. Decreased competition for timber might lead to collusion by purchasers and lower stumpage prices.

The savings in sale preparation effort would make it possible to offer more volume for sale. If more volume sold, there would be increased income to TFME. This would allow more personnel to be employed, further increasing the ability to prepare and administer more timber. This would help achieve the goal of cutting the allowable cut.

3. Alternative 3. Identify a number of small sale set-asides to maintain Indian loggers and offer the remaining volume in sales to maximize income.

There are currently nine certified Indian loggers on the Reservation with a combined ability to harvest approximately 20 MMBF of timber annually. The purpose of this alternative is to insure full employment for the Indian loggers by offering this volume only to Indian loggers in the form of small (1-5 MMBF) contract sales and timber cutting permits.

Environmental Consequences

(1) Direct Impacts. Offering 20 MMBF in small sales to Indian loggers only would help insure greater employment for Indian loggers on the Reservation. This alternative would generally have impacts opposite of those described for Alternative 2. Specifically, preparing more small sales and permits would require more sale preparation effort for a given volume of timber. Consequently, less volume would be cut and less intensive multiple use planning would occur for each sale.

As described in Alternative 2, impacts on non-timber resources vary depending on conditions other than sale size per se.

(2) Indirect Impacts. Indian loggers could count on an abundant supply of timber and better employment opportunities. More Indians might be attracted to enter the logging business.

Stumpage income to the Tribes would probably be less for the small sale set-asides since non-Indian loggers would be eliminated from competing for this timber. More small sales would make it less likely that the allowable cut could be achieved.

B. Forest Roads

1. Alternative 1. Proposed/No Action Alternative: Continue the present policy of designing low standard roads with a transportation system based upon unit area design for long-term timber management.

The logging roads are designed with minimum specifications sufficient to allow the removal of timber products. Generally they lay lightly on the land and have low visual impact. Little consideration is given in design to other uses besides those related to timber management. Traffic speed is relatively slow; thus trip time is high.

Environmental Consequences

(1) Direct Impacts. This alternative would be in keeping with the Tribes' desire, in most cases, to construct the minimum forest roads necessary to remove forest products and administer the forest. There would be low negative visual impact. Road cuts and fills would be relatively small and less unsightly. Soil disturbance would be less during construction and thus erosion potential would be reduced. Low standard roads would result in lower initial construction costs and thus high initial stumpage prices to the Tribes. However, low standard roads mean higher hauling costs, which means lower stumpage. This would occur because these roads result in reduced speed, longer trip time, and increased truck maintenance and breakdowns. Lack of turnouts and turn-arounds would also slow trucks down and increase travel time. All these would add to transportation costs and reduce stumpage prices. Because these low standard roads would remain essentially unmaintained between timber harvest entries (15-20 years), this alternative would result in lower road maintenance costs; however, this would result in higher reconstruction costs at each re-entry. This would also increase soil erosion.

This alternative would take some forest land directly out of production (approximately 4-5 acres/mile of road built). However, because of edge effects along these roads (increased crown exposure and competition reduction on one side of the remaining trees) growth on the remaining trees would increase. The net effect would be some loss in timber growth, but it would be minimal.

Wildlife would benefit overall under this alternative. Narrower roads with lower standards would be easier to cross and preceived safer by big game. Slower traffic speeds would result in fewer vehicle/animal collisions and thus fewer animal injuries/deaths. However, because road R-O-W slash is often piled below the road in unbroken rows, proper disposal of R-O-W slash or wildlife corridors thru it are necessary mitigation measures.

These roads would be relatively easy to close (i.e., with kelly humps), which would also aid wildlife by relieving some hunting pressure and vehicle disturbance. Under this alternative, there would be slower vehicle speeds and less traffic (because of poorer quality roads) and thus safety would be improved. However, limited sight distance, steeper grades, and sharper curves would reduce safety. Overall changes in safety are probably minimal.

Poorer quality roads would add directly to costs for post-harvest activities such as burning slash, planting, survival surveys, and thinning. Generally road building per se is a fairly long term committment of the land resource to a non-productive status with regard to growing trees for timber or other forest products. Although trees will re-establish themselves on closed or abandoned roads after relatively a short period of time, especially if the surface is roughened prior to closure, they generally do not grow well because of the disturbance to the soil horizons by the road building process and the compaction from vehicle traffic.

Some of the administrative costs would be lower because these roads and transportation systems would be planned, laid out, and the road construction administered by foresters. Forest road engineers - which are not on staff now - would not have to be hired in addition.

(2) Indirect Impacts. In the long-run this alternative would result in less public access because of low quality roads with essentally no maintenance (overgrown, rutted, washed out, blocked by cut slope failure or rocks, etc.) which would discourage vehicle travel.

Visually the scars from construction would be less visible and vegetative cover recovery would be quicker.

Administratively this alternative will result in increased vehicle gas and maintenance costs due to travel on poorer roads at slower speeds in lower areas. It will take longer to administer a timber sale or perform other forest management activities. There would be problems with lack of access, particularly if these roads were closed. In the long-term protection costs would be generally lower; this would result from less public access and thus fewer man-caused fires.

2. Alternative 2. Upgrade the forest road standards by requiring engineers to design and construct main and secondary haul routes and develop more stringent standards for construction, improvement, and maintenance of forest roads. Road designs would include specifications which would accomodate increased recreation and public use.

Main haul & secondary forest roads under this alternative would tend to become more like county roads; i.e., wider, straighter, less steep, better surfaced, and better maintained. Traffic speed would be relatively high for forest roads and trip time would be low. Overall use, in terms of numbers of vehicles, would increase in comparison to Alternative 1. Mitigating measures, such as road closures, would be necessary to reduce usage during portions of the year on some forest roads in order to preserve the increased investment by the Tribes and reduce maintenance costs. Road closures would also protect key wildlife ranges and calving areas, help to increase the big game populations by reducing hunting pressure and disturbance by vehicle and noise, and aid in reducing the incidence of man-caused fires in the forest zone.

Environmental Consequences

(1) Direct Impacts. This alternative would result in lower initial stumpage prices for the Tribes. It would require extensive extra planning, design, field work and administration of road construction. It would require hiring a forest road engineering staff that is not available now. The road construction costs would be increased and be a direct up-front economic cost to the Tribes. In the long-run, however, this would reduce roading costs at future entries and improve stumpage prices.

Improved roads would also increase truck speed and lower trip time - thus reducing log hauling costs. This would help to increase stumpage prices, too, and this would be effective from the first entry. Thus the economic benefits would favor improved roads over the long-term.

However, there would be more soil disturbance during road construction, larger cuts and fills, and a greater initial potential for erosion under this alternative. Therefore, increased funding would be required for mitigation measures such as grass seeding stabilization, small check dams (native materials) rolling dips, ditches, cross drains, drop outlets, and increased maintenance. Improved roads would mean directly improved public access (both tribal and non-tribal); more people could and would use these roads, especially if designed with recreation in mind.

This alternative would be more detrimental to wildlife generally. Improved roads would mean more open area to cross wider "unsafe" areas for big game, more vehicles, more people, more hunting pressure, more disturbance. There would be a great need for some form of mitigation measures, such as road closures, and appropriate funding for them.

Road closures would be necessary on some improved roads to protect the Tribes increased investment in them, to reduce maintenance costs, protect wildlife, and to reduce forest protection costs. These closures would be more expensive on wider roads probably would not want to dig kelly humps in improved road surface and would require steel gates set in concrete. Costs for vandalism and patroling would rise. However, there would be much easier access and reduced costs for forest administration and protection.

This alternative would take more land out of forest production; how much is lost would depend on the road width, and clearing width standards developed.

Building wider and better quality roads would be even more of an irreversible and irretrievable committment of resources due to the increased investment costs, more land being taken out of production, improved road surfaces preventing revegetation unless additional funds were spent, increased traffic, more maintenance dollars being spent and greater public acceptance of the roads' permanence.

(2) Indirect Impacts. Visually these improved roads under this alternative would be "good-looking" roads to many people but others would not like them in the forest zone. Many would like the improvement in vehicle speed, decrease in travel time, and less wear and tear on their vehicles. But other persons would not want the forest "opened up". They simply would like bare minimum roads that have resulted from logging operations under the present policy.

In the long run administrative costs would be reduced under this alternative because of improved access and better quality roads.

Actual erosion over extended periods of time would be reduced due to gentler road grades, improved drainages, stabilized cut and fill slopes, better road surfaces, and better road maintenance.

C. Timber Sale Unit Design and Priority

1. Alternative 1. Proposed/No Action Alternative: Timber Sale unit design and priority for offering based largely on silvicultural needs and mitigate adverse impacts on other resources. See page 131.

2. Alternative 2. Timber sale design and priority based largely on end products and market condition.

This alternative attempts to maximize the economic return from all commercial timber species. Without abandoning silvicultural goals, this alternative places top priority on matching available timber to the timber products receiving the most attractive economic return at the time. "Most attractive economic return" doesn't presuppose highest stumpage price. Rather if a timber product, for example paper chips, were experiencing high market demand, the corresponding timber species, say bullpine, should receive high stumpage relative to its historic average prices. Using this example, relatively high bullpine stumpage would still be well below yellow pine prices even if yellow pine prices were down. Therefore, sales in bullpine stands would be emphasized while old growth pine would be retained until that market improved. Though this maximizes income over time, it causes fluctuations in annual tribal income.

In order to take advantage of market conditions, large intensive efforts would be made to sell sales while the market is favorable. Even then, with a sporatic economy there is no guarantee of capturing a favorable market, since preparation of a modest sized sale would take at least five months. In that period, substantial market changes could take place which may nullify the economic advantage being sought.

This alternative would then resemble the preferred alternative with one difference. The silvicultural goals would be accomplished by harvesting as much "market preferred timber" as the silvicultural prescription would allow.

3. Alternative 3. Design sales and sell them with the goal of providing an even-flow of income to the Tribes.

   This alternative attempts to sustain an even-flow of income above a fixed minimum through the design and timing of sales. The Tribe would set a minimum annual revenue figure they want supplied through stumpage. B.I.A. Forestry and T.F.M.E. would design and prioritize sales to generate at least that minimum.

   This alternative would cause some fluctuations in workload and cut volume. When stumpage prices are low more volume would be cut; perhaps exceeding the A.A.C. If the volume exceeded the staff's normal capability to prepare sales, silvicultural goals may be modified for production. When stumpage is high there may be slack in the timber sale program. This would lead to fluctuation in cutting cycles and may interrupt sustained yield. To reduce the volume fluctuations, sales could be put up according to value. In other words, when stumpage is high the income could come from low value stands. The reverse would be true when stumpage was low. This policy would result in a relatively low dollar return per volume of timber cut. Tribal income may be stabilized through this procedure, however, it may be detrimental to forest growth, vigor and long-term value.

   The best way to mitigate this is by making silviculture the first priority. This makes this alternative similar to the preferred alternative. The difference is that the scheduling of sales would be made with close attention to supplying an even-flow of income. However stand harvesting would be guided by silvicultural and not economic decisions.

III. Silvicultural Program

A. Christmas Tree Cutting Policy

1. Alternative 1. Proposed/No Action Alternative: Keep present policy of unregulated Christmas tree harvesting. See page 144.

2. Alternative 2. Integrate Christmas tree harvesting with timber management on all suitable forest acres. This would involve modifying the scheduling and administration of the T.S.I. program. On areas with stocking levels above those needed for sawlog production the excess trees would be managed and thinned commercially as Christmas trees. The timeframes currently allowed for T.S.I. operations would be lengthened from 1-2 years to 5-10 years to allow culturing of potential Christmas trees.

   Adequate administration of this program would require additional staff in the B.I.A. Branch of Forestry and the Tribes T.F.M.E.

   Successful implementation of the program would require extensive public relations work with the Tribal membership to overcome resistance to any change in the present unmanaged and largely unregulated Christmas tree program. The program would need to be phased in gradually to insure widespread acceptance.

   The impacts on wildlife, especially big game, would require consideration in selecting areas on which to implement this program. The primary mitigations would involve 1) concentrating selected areas in such a way that adjoining drainages would not be affected; and 2) avoiding any critical wildlife habitat.

Environmental Consequences

a. Wildlife and Threatened and Endangered Species

(1) Direct Impacts. Management of selected areas for commercial Christmas trees would mean that those areas of the forest where this was practiced would receive regular seasonal activity from late spring through the fall. This activity would start sometime immediately following a logging entry and continue for five to ten years. The level of activity would be very low, relative to a logging operation, but would probably be sufficient to keep some species from using the area. Elk in particular are sensitive to very low levels of activity once they have been forced from an area by logging activity. Wildlife species that would use those areas in late fall and winter or that would be relatively insensitive to such a low level of activity would be largely unaffected.

b. Timber Management and Other Human and Community Developments.

(1) Direct Impacts. Management of excess trees for a saleable product, would significantly increase the per acre yield of forest land where this was practiced. This practice would

show a significant increase in yield over the present unmanaged Christmas tree program. The trees would be produced in greater numbers and of high quality, yielding a higher monetary value per acre. This higher value would probably lead to some financial return to the Tribe where none currently exists.

The cost of such a program would have a significant impact on the overall management of the forest. To implement the program would require a partial restructuring of existing forest management priorities or require additions to the forestry staff to insure effective management of the program.

Implementation of this program would cause some significant disruption to the socio-economic aspects of the present unmanaged and only partially regulated Christmas tree program. Many of the people who cut trees have been doing so for 20-30 years, or have grown up in families where Christmas trees have traditionally been the main source of seasonal income. Presently, there is little concerted effort at investing time or money to stabilize or increase their income from Christmas trees. Conversion to a program where time and money needed to be invested, prior to the harvest, would be totally foreign to many of these people. This unfamiliarity would cause resistance to any change and bring considerable political pressure on the Tribal Council and the Superintendent.

3. Alternative 3. Establish set aside areas for Christmas tree production, excluding these areas from the sawlog management base. This would involve managing areas of forested land solely for the production of Christmas trees. The management of this land base would be outside the scope of the Forest Management Plan and the Superintendent's involvement would be limited to supplying technical assistance upon request and insuring compliance with CFR. The primary mitigation would involve location of these areas to minimize the impact on wildlife. Implementation of this program would require actions similar to those for the integrated management option to overcome any resistance to change in the present Christmas tree program.

Environmental Consequences

a. Wildlife and Threatened and Endangered Species

(1) Direct Impacts. The areas set aside as Christmas tree production areas would receive rather intense use from spring through the fall harvest season. This continuous activity would cause those wildlife species that are sensitive to regular human disturbance to move out of the area. To supply a projected 60,000 bales of Christmas trees per year would require approximately 6000 acres of land. If this 6000 acres was located in one area on the Reservation the impact on sensitive wildlife species would be significant. If these areas were more dispersed, similar to that described in the alternative on integrated Christmas tree management then the impacts would be similar to those described in that option.

(2) Indirect Impacts. Concentrating the Christmas tree associated activity to a few areas would reduce the widespread seasonal hunting pressure characteristics of the present Christmas tree harvest season.

b. Timber Management and Other Human and Community Developments

(1) Direct Impacts. Removing 6000 acres from the commericial timber base would reduce the AAC by an estimated 1.7 board feet. This estimate is based on a projected annual growth of 290 bd.ft./ac./yr. for the uneven-aged component (1984 Forest Inventory Analysis).

Dedicating acres to Christmas tree production would maximize the per acre yield of quality, cultured in the wild, Christmas trees. However, by foregoing the AAC of timber that would be possible from these lands, under integrated management, the net per acre monetary yield experienced by the landowner would be determined largely by the stumpage that they collected from the sale of Christmas trees under a free use system, similar to the present one, the landowner would lose money on this alternative. Although this cannot be construed as an irretrievable committment of resources, it is a relatively long term.

The acceptance of this program would encounter the same resistance as that described in the integrated management alternative. Implementation and management of this program would require more administrative time than the present program but considerably less than that of the integrated management alternative. The primary administrative involvement would center around insuring compliance with the management objectives for Indian lands as described in the CFR.

B. Precommercial Thinning Treatment

1. Alternative 1. Proposed Alternative: Set treatment priorities and base site selection on site quality and vary thinning prescriptions to obtain site-specific stocking levels. Lift all constraints on treatment methodology. See page 156.

2. Alternative 2. No Action Alternative: Keep current policy. Present precommercial thinning guidelines do not permit cutting trees above 5 inches in diameter unless they are considered green culls. Further a rather inflexible and uniform spacing of 15 x 15 feet has become the accepted norm on all sites.

Environmental Consequences

a. Vegetation and Timber

(1) Direct Impacts. This policy frequently prevents achievement of optimum stand densities that will result in maximum future board foot yields. Further, recovery values are lessened as the usable wood is grown on more stems than necessary. Slash loadings may be reduced over alternative 1, as fewer stems are cut.

Present guidelines prevent achievement of some long term and immediate buffering against insect pests such as Mountain pine beetle and spruce budworm. Given present merchantability standards, it becomes impossible to remove all visible mistletoe from some stands. When precommercial thinning is limited to 5 inches, achievement of the specified stocking goal must come from heavy removal of trees less than 5 inches. The opportunity exists to eliminate an age class, which is counter to uneven-aged management goals.

(2) Indirect Impacts. Generally less regeneration will develop as stand density increases, and the percentage of climax will increase. Thus thinned but still overstocked stands will afford little opportunity to develop uneven-aged structure unless commercial entries can be made.

b. Wildlife

(1) Direct Impacts. The favorableness of this alternative will depend in part upon existing cover/forage ratios for any given area. If cover is needed, denser stands will positively serve the needs of big game. If foraging areas are in short supply, this alternative will contribute little to big game enhancement. Slash loadings may serve to impede game movement and render areas unusable for a number of years.

(2) Indirect Impacts. It is difficult to predict specific indirect impacts on wildlife populations, considering the great variety of site and stand conditions where precommercial thinning will occur.

c. Social - Economic

(1) Direct Impacts. As sites selected for treatment will have a more generalized prescription applied, total administration costs for site selection layout, and administration may decrease. However, the number of acres available for treatment may decrease, as some stands may have to be rejected for treatment under these restricted specifications since silvicultural goals can not be met. This will reduce income to Tribal members at the rate of $75/acre.

This alternative is politically more acceptable as the average citizen does not care to see material wasted that might make a product, even if the product cannot be economically harvested.

Some income from trees over 5 inches in diameter will result in the future as these trees reach merchantable size. However, many of these trees are very slow growing due to past suppression so from an economic stand point it is undesirable to retain these trees.

(2) Indirect Impacts. Denser stands yield more total wood fiber than those spaced for maximum board foot production. If technological and economic forces move in the direction of small tree/whole tree utilization, this alternative may best serve the economic needs of the landowner in the future.

C. Even-aged Block Size

1. Alternative 1. Proposed Alternative: Increase shelterwood unit size to an average of 25 acres and clearcut/seedtree block size to an average of 10-20 acres, except where constrained by visual objectives. See page 168.

2. Alternative 2. No Action Alternative: Keep current policy of maintaining shelterwood block size below 15 acres, and restrict clearcut and seedtree blocks to less than 8 acres in size. Visual impact will be the major factor in determining any block size. These policies would not apply to catastrophies such as blowdowns, insect outbreaks or fires requiring large scale salvage operations. This alternative does not affect the total acreage of even-aged blocks on any given sale but would influence the number of blocks.

Environmental Consequences

(1) Direct Impacts. The number of blocks required to treat a given acreage on a timber sale would increase. Smaller blocks may provide more potential for mitigating visual impacts through screening and locating them judiciously at least for the current entry.

Indirect impacts of this alternative are greatest on line skidding blocks and include increased layout time, increased length of fireline construction required, more cable settings required, increased time required in preparing and executing broadcast burns, and a greater potential to permanently isolate patches of timber from harvest, unless additional roads are built.

As mentioned previously, the smaller block alternative will provide a greater edge effect, or total perimeter, which indirectly affects wildlife use, and increase the potential for dwarf mistletoe reinvasion from the reserve stand to the new regeneration.

The significance of the above listed impacts include substantially higher administrative and logging costs, hence short term reduced stumpage income. Long term effects of the smaller block alternative include a higher potential for loss of mistletoe control achieved, through reinvasion from the increased total perimeter. Neither of the alternatives, when properly applied would be irreversible or irretrievable committments of resources.

D. Mistletoe Control Policy

1. Alternative 1. Proposed Alternative: Accelerate treatment of mistletoe infected stands to complete coverage within 40 years. See page 179.

2. Alternative 2. No Action Alternative: Continue with present policy which provides for liquidation of one-third of Class I [1]/stands in three 20 year intervals.

Environmental Consequences

a. Vegetation and Timber

(1) Direct Impacts. This alternative allows the present acreage of Class I stands to be held in a semi-productive or unproductive state for a longer time period than alternative 1. The growth reductions from dwarf mistletoe have been shown to be significant. Based upon Flathead Reservation CFI data 2/ moderate tree infection reduces growth by up to 30% and heavy infections by 60%. Additionally, there is deterioration of wood quality and increased mortality. Thus stand growth reduction may be even greater than the figures above indicated for individual trees. Degenerate stands of Douglas-fir and western larch also provide habitat for spruce budworm and larch case bearer. Delayed removal of infected seedwalls mandate species conversion adjacent to newly created regeneration cuts. Shorter conversion periods however may allow enough host species to escape infection such that the stand may be adequately stocked without costly planting efforts.

(2) Indirect Impacts. The stated purpose of the Forest Management Plan is to promote uneven-aged management where it is biologically feasible. This alternative would delay the conversion process to uneven-aged forest management within the temporary even-aged component. Under this alternative, in 40 years, the process of conversion could begin on one-third of the temporary even-aged component, while under alternative 1 fifty percent of the component would be of a commercial size to permit the beginning of age class building.

1/ Class I stands have more than 33 percent of the overstory trees infected and more than 33 percent of the understory trees infected or absent.

2/ Flathead Indian Reservation, 1973 Forest Inventory(CFI) Analysis

b. Wildlife and Grazing

(1) *Direct Impacts*. This alternative may give big game populations such as deer and elk a slight edge over an accelerated harvest schedule. It allows for less disturbance and possibly more security area and travel corridors than if 50 percent of the area were treated at once. However, the overall placement of blocks will effect this, and actual security area may be the same. Stand diversity is maintained for a longer time period. Assuming that 40 year old trees will provide thermal cover, there should be a supply of forage, thermal and hiding cover over a longer period of time. If 50 percent of this strata is removed in each 20 year cycle, in 20 years all acres as in a given area would be either clearcuts or seedtrees or 20 year old plantations. Thermal cover could be a limiting factor. These concerns would be alleviated where continuous, large acreages of Class I stands do not exist. Impacts on grazing would be only minimal as most Class I stands are not prime grazing areas due to slope and distance from preferred grazing sites.

c. Social-Economic

This alternative will lower the annual allowable cut. Existing decadent old growth will not be liquidated as quickly. Thus a portion of the Class I component will not be placed under intensive management for an additional 20 years. This translates into reduced stumpage to the Tribes over the long run. The stark impact of regeneration cutting will be lessened under this alternative as fewer cutting units will be created this and subsequent entries.

d. Land Resources

Soil, water, topography. Less soil disturbance will occur at each entry mainly as a result of less site preparation and logging, although road mileage would likely be similar for both alternatives 1 and 2. This alternative allows for an extended recovery period, although soil erosion and stream degredation is not a major concern due to rapid revegetation with grasses, forbs and shrubs. Implementation of various other mitigation measures of the Forest Management Plan would prevent any signficant adverse impacts on the soils and water resources.

3. *Alternative 3*. Selective harvest of infected stands. No even-aged prescriptions and/or artificial reforestation efforts for the purpose of changing species composition would be made.

Environmental Consequences

a. Vegetation and Timber

(1) *Direct Impacts*. No mistletoe control would be possible. Harvest activities may increase the spread of mistletoe as more light is made available to infected stems. This further reduced growth and quality of the remaining trees.

Further, regeneration would be infected by the time it was three feet tall or over 10 years of age. Trees infected at this age likely will not make a useable product. The result will be increased mortality in all age classes of the host species.

(2) Indirect Impacts. Over time the host species may largely eliminate itself from the stand as it become relegated to coniferous brush. Sites will be grossly under utilized or will revert to non-host species, depending upon site factors, seed source, fire occurance, etc. Gradual deterioration could be reversed by planting after selective harvest. This however would be costly and would not provide a setting necessary to capture economic returns from an intensive operation such as artificial reforestation. Fire hazard would greatly increase over time as increased mortality added to fuel loading.

b. Wildlife

(1) Direct Impacts. This policy would have detrimental effects upon wildlife for several reasons. Uniformity rather than diversity would be promoted as large acreages were selectively logged. Further, more areas would have to be covered to achieved target volumes. The result would be fewer security areas available, with most areas having some type of treatment. Impacts could be lessened by good timing of harvest cuts where big game concerns such as calving or winter range occur. However, the results may be shortlived. Slash could be treated. As little thinning would occur, slash depths may be acceptable. More cavity nesting bird sites would become available.

c. Social-Economic

(1) Direct Impacts. Due to accelerated mortality, more firewood would become available. Further, scenic values may not be compromised to the degree that would occur with evenage harvest methods provided trees were left well spaced in stands regardless of infection level. The annual allowable cut would decrease as only a fraction of the sites potential would be captured over time. This, of course, translates into reduced income to the Tribes. Thinning operations would not occur on those acres and reforestation would not likely occur. The result would be reduced income to individual tribal contractors who work in forest development projects.

(2) Indirect Impacts. This alternative would not provide for implementation of "state of the art" forestry, and would open the Bureau of Indian Affairs up to future lawsuits. With declining vigor stands, it would be more difficult to estimate an annual allowable cut. This would complicate the long term planning effort.

E. Lodgepole Pine Management

1. Alternative 1. Proposed/No Action Alternative: Continue present policy of intensifying lodgepole pine management and access the inaccessible portions of the resource. See page 190.

2. Alternative 2. Manage only the sawlog size lodgepole pine and permit unregulated harvest of unmerchantable lodgepole pine. The LP 1 and LP 2 timber types, (1981 timber typing), would be included in the AAC as part of the commercial forest base. Growth projections would be reduced to allow for largely unregulated harvest of post and rail products from the LP 1 component. As areas of this submerchantable lodgepole were harvested, they would be regenerated and subsequently managed for sawlog production.

   Mitigating measures are required to minimize the impact of; 1. large clearcut areas, and 2. the destabilizing effect on the economy, that this alternative would have. To minimize the impact of large clearcut areas the following measures would be implemented:

   1. Monitor harvest activities and stop any activity that would result in significant soil erosion and/or deterioration of water quality and;

   2. Site prepare and reforest portions of the block as it developed to minimize the impact of large blocks on reforestation success.

   To minimize the long run destabilizing effect of an unregulated harvest on the economy, the Tribe would need to develop more stable employment opportunities to replace those currently offered by the post and pole industry.

   Environmental Consequences

   a. Soils and Surface Hydrology

      (1) Direct Impacts. Where extensive areas of high volume post and pole stands exist, unregulated cutting would lead to large clearcut areas of 100 acres or more. Blocks of this size would have the potential for significant soil erosion and deterioration in water quality.

   b. Wildlife, Fisheries, Threatened and Endangered Species.

      (1) Direct Impacts. Large clearcut areas would reduce effective big game habitat and any significant deterioration in water quality resulting from these areas would have a significant impact on any downstream fisheries.

      (2) Indirect Impacts. With unregulated harvest, large areas would remain open to vehicle access for extended periods of time. Wildlife species that might ordinarily use openings in the forest would be discouraged from doing so because of roads being continually open for vehicle access. The ultimate decision regarding significance of this impact on wildlife would be made by the landowners, based on their priorities for resource use.

c. Timber Management and Other Human and Community Developments

(1) Direct Impacts. Large clearcut areas, with little regulation of harvest methods, would result in adverse microclimate conditions and correspondingly high reforestation costs.

(2) Indirect Impacts. Timely reforestation of small, dispersed cutting areas would be delayed until these areas were large enough to allow efficient treatment. This delay, of several years in some cases, would have an impact on overall forest productivity, but would be insignificant because these areas make up a relatively low proportion of the entire forest.

Unregulated harvest of the existing lodgepole timber type would not result in a regulated forest capable of an even flow to the Tribal post & pole plant. In the long term (20-30 yrs) this would force the post & pole plant to depend on off Reservation sources of raw material or scale back operations to a level that the reservation resource could supply. This would have a long run destabilizing effect on the Reservation economy because of the large number of Indian families that derive their living from the local post and pole industry.

d. Other Resource Values

(1) Direct Impacts. The aesthetic and recreational values of the lodgepole pine timber type would be more heavily affected by unregulated harvest than by regulated harvest. The latitude to manipulate cutting unit size, shape and placement to mitigate the impacts on these resources would be largely foregone under an unregulated harvest regime. Although the impact on these resources could be significant, the ultimate decision of how important this impact was, would be the decision of the landowners.

F. Marginally Productive Sites

1. Alternative 1. Proposed Alternative: Identify lands with productive capabilities of less than 20 Cu.Ft./Ac/Yr and de-emphasize timber management. See page 204.

2. Alternative 2. No Action Alternative: Keep present policy of managing all productivity classes approximately equal. Stand investments such as stocking control, site preparation and reforestation would be applied on all habitat groups along with intensive harvest operations.

Environmental Consequences

a. Vegetation and Timber

(1) Direct Impacts. Implementation of this alternative would tend to disrupt potentially fragile ecosystems both at the warm-

dry end (habitat group A) and cold wet end (habitat group G) of the environmental spectrum. At both extremes revegetation with tree species may be slow or in some cases impossible if proper silvicultural techniques are not strictly adhered to. On habitat group A, moisture is limiting; however these sites will revegetate with various grass species quickly. In time, given the proper synchronization of climatic factors and seeding habits establishment of ponderosa pine will occur. The effects of over zealous management at the higher elevations may have near irreversible effects. Temperature is the limiting factor. Unless openings are kept very small to trap snow for insulation purposes, provide long wave radiation and protect from high amounts of solar insulation, revegetation of tree species may be a very long term process.

(2) Indirect Impacts. If silvicultural prescriptions are not carefully planned within the upper elevation habitat types, wind throw may be come a serious problem, resulting in severe buildups of spruce beetle. This will momentarily expose some sites, but in most cases will speed succession, promoting site occupation by subalpine fir and associates.

b. Wildlife and Grazing

(1) Direct Impacts. The effects of this alternative would be greatest on wildlife and grazing within habitat A. The range of habitat types within this group provides both summer and especially winter range for big game. Both deer and elk frequent portions of this group during various times of the year. The interspersion of grass-forest provides important habitat for big game, and disturbance from intensive forest management will reduce its short term and intermediate effectiveness. Mitigation of adverse effects would be necessary and might include such things as deferred TSI treatments, of slash, closely timed operations to minimize the disturbance factor and possible set aside areas for security.

More intensive management would have beneficial effects upon the range resource provided good range management followed forestry operations. Forage production would increase, and likely remain higher for some time. Range use on habitat group G is nearly nonexistant, but big game including deer, elk and bear are common. While forage may in some cases increase, it likely is not a serious limiting factor. The removal of cover and security areas would have the greatest effect. Close scheduling of harvest activities and careful planning of cutting unit location would minimize disruption. Special care would be necessary where endangered species such as the grizzly bear are found.

c. Social-Economic

(1) Direct Impacts. This alternative provides poor stewardship of the economic resource, as equal investments are put in areas of likely good and marginal return. Given a fixed income,

the most productive sites for tree growth would likely be short changed in terms of investment. This alternative is in conflict with Forest Management Plan Policy. Advantages include ease of record keeping. Such blanket management strategy does not require a good data base, which is expensive to collect and maintain. Further, administration of forest management would be more simplistic. The upper elevation habitat types have considerable recreational and scenic value. Management of any intensity may detract from these values, especially "high country" wilderness effect that many sites are capable of providing. Appropriate silvicultural practices for the specific sites involved, care to proper road layout and good cutting unit design will minimize these adverse effects.

(2) Indirect Impacts. Less than good investment of financial resources now will have long term cash flow impacts on the tribes. This impact may be extremely important when considering such funds as the various add-ons which may be terminated in the near future. Mid course corrections in the use of short term funds is not always possible.

d. Land Resources: Soil water topography

(1) Direct Impacts. Minimal impact can be expected on most Group A sites if reasonable care is taken in planning and executing forest management prescriptions. Impacts at the upper elevation are likely to be more pronounced and longer lived. Clearcutting may cause excessive ground water on some habitat types, with partial cutting leading to serious wind throw. The upper elevation habitat types such as subalpine fir/Luzula hitchcockii are the major sources of summer stream flow. Watershed enhancement is of prime concern. Care must be exercised in planning and executing any soil disturbance activity since revegetation is slow, and site preparation on steeper slopes and road construction may contribute considerable sediment. Moisture content of soils is an important factor when considering compaction and displacement. These soils are either snow covered or wet a large portion of the year, thus encouraging operations when soil conditions are marginal.

IV. Other Resources

A. Reserve Corridors Along Streams

1. Alternative 1. Proposed Alternative: Classify all riparian/water influence zones as restricted timber management zones.

2. Alternative 2. No Action: Keep present policy of a fixed two-chain reserve strip along live streams.

This is the easiest action to take but is the least flexible. The policy would simply place a two chain buffer around all live streams. No activity would then occur within these four chains. With limited funding and staffing cutbacks for specialist, this would eliminate much of the need for a fishery biologist on timber sales. Water quality, fishery and wildlife needs would be protected.

This policy would not provide for complete protection of the riparian zone. Riparian areas occur in places other than along live streams. These intermittent and ephemeral streams would not be included under this option. Activities in these areas can affect water quality, quantity, and temperature. Often intermittent and ephemeral streams are above the live streams and activities in them would affect the quality of the live streams. Additionally, these areas are important to water quality in their own right.

More importantly, this option does not provide for management flexibility and for habitat improvement. When management activities are scheduled in an area, there may be opportunities to improve the fish or wildlife habitat in a riparian zone. Past management or natural events could have degraded the stream zone; a fishery management prescription could be developed for the stream corridor that would improve the habitat of the stream. These activities are not allowed under this option. Forest-pest problems in the stream corridor could not be treated even when they would not significantly effect the riparian resources. Silvicultural options that would neither degrade nor improve the riparian zone would not be allowed.

3. Alternative 3. No reserve corridors along streams

This alternative would neither protect water quality, fisheries, nor wildlife values along stream corridors. Timber harvest without considering the unique properties along streams could signficantly increase sedimentation and water temperature. Cutting and skidding trees in the riparian zone would increase sedimentation. The removal of shade would increase water temperature. Additionally, important wildlife habitats in riparian areas would not receive the special consideration needed for their management. The portion of old-growth timber reserved in stream corridors would not be available, increasing the threat to old-growth dependent species.

Timber management would be able to harvest all trees and treat any disease problem like mistletoe, root rot, etc., in the corridors. Controlling disease in the stream corridors would aid the control effort in other portions of the commercial forest. Riparian zones are productive growing sites and these areas would then be under a harvest system.

The political and legal system would not allow this type of option. Multiple use and the NEPA process would not find this option as compatible with state-of-the-art forest management practices. Tribal concerns are for multiple use and this practice would be basically a single use option.

B. Big Game Winter Range

1. Alternative 1. Proposed/No Action Alternative: Delineate important winter range locations in consultation with wildlife specialists for each timber sale and constrain timber harvest as needed to minimize adverse impact on winter range. See page 227.

2. Alternative 2. Restrict timber management to only harvests that would enhance important winter range areas. This alternative would make wildlife the primary resource on winter range areas. Timber management would only be conducted on these areas if it would benefit wintering big game populations. This alternative would require land-use planning for land management decisions on the Reservation. This alternative is how USFS, Region 1 manages their big game winter ranges.

Environmental Consequences

This alternative would decrease the allowable annual cut (AAC) by an undetermined but significant amount. The Reservation has a considerable area of winter range and this overlaps the commercial timber base. Timber sales from winter ranges would undoubtedly bring less income to the Tribes because of lower volume and restrictions. Sale planning and design would be more difficult than a sale simply for timber harvest but probably no more difficult than for a timber sale considering multiple uses. Since wildlife is the primary resource and timber harvest would only take place if would benefit big game, the Wildlife Branch would need to spend more time in timber-sale planning and layout.

Big game populations are under stress during winter. Winter is a key time of year and may be crucial to the health of big game populations. Timber cover is an important component of winter ranges in Western Montana. If the proper canopy cover is not near feeding areas, travel times and distances would increase, further increasing energy demands. Disturbances on winter ranges is determental, also because of increased energy demands. If slash disposal is not properly conducted, preferred bed sites would not be used and travel would be impeded. The Montana Elk Logging Study recommends that each winter range be managed on a site-by-site basis, for there is only a narrow margin for error.

If care was not taken for the management of big game winter ranges, populations would decrease through time. While this would not necessarily be irreversible and irretrievable committments of resources, the effect could last for many years, depending on the severity of the mistakes.

C. Old Growth Timber Policy

1. Alternative 1. Proposed/No Action Alternative: Keep present policy of cutting all old growth stands outside wilderness/inaccessible areas. See page 237.

2. Alternative 2. Manage some stands with an old-growth component and reduce their contribution to the commercial forest base. Certain species in the Douglas-fir zone, like the pileated woodpecker, need relic trees surrounded by younger trees. Species in the spruce/fir zone, like pine martin, require old growth, multi-storied stands. Intensive timber management would retain few of these components, so old growth dependent species are losing habitat.

   Old growth stands are retained along stream corridors and in the Tribal wilderness areas. These areas partially satisfy old growth requirements. The species in the Douglas-fir zone have little habitat protected in the wildernesses so require special considerations in the commercial forest. Blocks of approximately 1000 acres scattered over the forest where 1-5 old-growth trees per acre are retained in perputity; these trees should be Ponderosa pine or western larch. Most of the time these trees could be seed trees from even-aged blocks. Where even-aged treatments are few, some trees in the uneven-aged stands would need to be set aside.

   Environmental Consequences

   Managing for old-growth species would decrease the Annual Allowable Cut (AAC) depending on the zone. In the Douglas-fir zone, leaving 1-5 seedtrees per acre should satisfy the habitat requirement. In the spruce fir zone, the cost would be more substantial because stands would need to be on longer rotations than under intensive management. Contrary to the principles of intensive management, not all mortality would be captured but trees would be left to die for other uses.

   Managing for old-growth dependent species would help protect these populations. These species could be threatened with extinction if sufficient habitat was lost. Land management constraints would be severe if many of these species were officially listed under the Endangered Species Act. Primary cavity nesters, those species who build their own cavities, generally do not have the behavioral flexibility to adapt to the changing habitat conditions as fast as it is being modified.

   The complete loss of old-growth stands would be essentially an irreversible and irretrievable committment of a resource.

D. Grazing and Commercial Timber Lands Policy

1. Alternative 1. Proposed Alternative: Identify commercial forest lands currently/potentially valuable for livestock grazing and develop additional use restrictions to benefit forage and timber. The proposed alternative may require constructing fences and cattleguards which would prevent livestock movement to critical areas. Reduction of livestock numbers and exclusion of livestock from normal grazing zones may also be required. This approach emphasises the management of commercial forest as a primary resource.

2. Alternative 2. No Action Alternative: Continue with present policy and guidelines which contain predetermined stocking rates and presently allow mostly unrestricted grazing within commercial forest. Management decisions, concerning livestock restrictions in commercial forest are made on a case by case basis, subject to available resources, interdepartmental and Tribal concerns. No immediate reductions of livestock numbers would occur.

3. Alternative 3. Primary Use Alternative: Identify commercial forest lands where timber production and harvest are the primary use, and exclude these areas from livestock utilization. Under this approach, commercial forest lands would be managed primarily for timber production and would preclude range management considerations. It would require drastic reductions of livestock numbers to discourage livestock from entering accessible commercial forest areas and/or the construction of numerous fences and other installations to prevent livestock movement into these areas.

4. Alternatives Rejected from Study. One alternative which was rejected from the study, consisted of managing areas where timber harvest and improvement practices have enhanced the amount of available forage, for livestock production. Reasons for rejecting this alternative are that the increases is useable forage production are of short duration and may not be of substantial quantity to permit upward adjustments of livestock numbers. Areas of this type are valuable in that they relieve pressures from primary grazing zones and that they are better left for wildlife considerations.

   Another alternative which was rejected from the study consisted of managing timber types of habitat type group A for livestock grazing, as opposed to timber production. Reasons for rejecting this alternative were determined by computing actual revenues the Tribes would receive from stumpage or forage based on their current market value. It was estimated, under optimum conditions, that the Tribes would receive $5.60/acre/year from timber production or $1.50/acre/year from forage production, if managed entirely for either purpose. It was concluded, that under these circumstances where the Tribes are the landowners and where they grant to other individuals the privilege of use to that land, it is monetarily more beneficial and overall more viable to simultaneously manage for forage and timber productivity in timber habitat types group A.

5. Formulation and Comparison of Alternatives. Alternatives selected for the study were considered to represent a broad range of social and environmental circumstances stemming from alternatives which emphasize resource production to an alternative which emphasizes resource protection. The following is a brief comparison of all the alternatives and their associated impacts on resources of concern.

The primary difference between alternative 1, the Proposed Alternative and alternative 2, the No Action Alternative, is that no policy concerning livestock grazing and commercial timber lands has been established. Resource protection measures, presently implemented on a priority case by case basis, would be developed into standard guidelines and incorporated into the Forest Management Plan. Moreover, alternative 1 would encourage stronger, participation among resource managers to accomplish policy objectives.

Alternative 1 should increase seedling survival and enhance timber and forage productivity by developing grazing use restrictions in commercial forest areas. Alternative 3, the Primary Use Alternative would emphasis near climax range conditions by abolishing livestock grazing in commercial forest areas. Both alternatives 1 and 3 would enhance other resource values, primarily wildlife habitat and water quality regimes.

Alternative 2 on a reservation wide basis, has no immediate advantageous affect upon the aforementioned resources, but does focus attention and available resources to special problem areas on an individual basis.

The implementation of alternative 3 would severely impact Indian livestock operations by forcing major livestock reductions on range units associated with commercial forest. Alternative 1 would require some livestock reductions, but is similar to alternative 2 in that it would be more flexible and easier to implement. Adequate administration of Alternative 1, the Proposed Alternative, would require additional staff time in the Bureau of Indian Affairs, Branch of Forestry, Wildlife and Land Services.

Ultimately, adequate administration of alternative 3, the Primary Use Alternative, could be provided by one person in the BIA, Branch of Land Services. However, during the onset of implementation additional services and staff would be required to accomplish the objectives of this alternative.

Successful implementation of Alternative 1 would require extensive public involvement and gradual introductions of use restrictions to achieve social acceptance.

Alternative 3 most likely would never gain ample political acceptance.

Environmental Consequences

This section is an addendum which supplements the analysis on page 249. It will describe the consequences of implementing each of the added alternatives and includes some further analysis on the consequences of the proposed alternative.

a. Surface Hydrology

A more complete discussion concerning the effects of livestock grazing on water quality is included under section e., Fisheries.

1. Alternative 2, No Action Alternative.

a. Direct Impacts: No immediate change from the present water quality is anticipated.

b. Indirect Impacts: Water quality in hydrologically sensitive areas where use restrictions have been imposed, would improve. Other conflicts would be minimized. In other sensitive areas where use restrictions have not been imposed, seasonal decreases in water quality may occur.

2. Alternative 3. Primary Use Alternative.

a. Direct & Indirect Impacts: Subsequently, soil stabilization and increases in forage cover would decrease surface run-off and would reduce erosion potentials and stream sedimentation thus improving the overall water quality in commercial forest areas. However, little gain could be expected if commensurate protection of riparian zones isnot afforded down stream of commercial forest.

b. Range

1. Alternative 1, The Proposed Alternative

a. Direct Impacts: In addition to those direct impacts described on page 249, this alternative may necessitate the removal of livestock from certain sites, such as clear cuts and highly productive timber habitat types, where livestock are inhibiting tree seedling survival and regeneration. It has been suggested that enclosures be developed to exclude livestock from these areas for a period of 5 - 10 years, or for as long a time that is needed to allow seedlings to progress to a stage where they are not so vulnerable to livestock damages. After this time, the enclosed areas would again be opened to livestock management.

The implementation of this alternative would demand additional fencing materials and other supplies which are not presently available. Funding to purchase additional materials and services would need to be provided by other means to accomplish policy objectives.

b. Indirect Impacts: In areas where livestock have been excluded those indirect impacts as listed below, under Alternative 3, would apply.

2. Alternative 2, No Action Alternative.

a. Impacts: Those direct and indirect impacts and mitigation measures as described in the range section of the University of Montana's Environmental assessment, page 250, would also apply here.

3. Alternative 3, Primary Use Alternative.

a. Direct Impacts: Implementation of Alternative 3 would immediately affect over 90% of all lands contained in Tribal range units. Ultimately, 70% of these lands would be eliminated from livestock grazing.

b. Indirect Impacts: The elimination of grazing in commercial forest would reduce browzing and mechanical injuries to tree seedlings, thus increasing their survival. Areas where livestock have compacted the soil would stabilize in a few years. Range trend would be towards climax, but because of other resource uses, climax range conditions would not be expected in many areas. Timber productivity could be reduced by the increased competition with herbaceous and other woody type plants.

c. Soils

1. Alternative 1, the Proposed Alternative.

a. Impacts: Direct and indirect impacts as listed below, under alternative 3 would apply in commercial forest areas where livestock have been excluded. The degree of soil stabilization is dependent upon the period of time livestock are removed from these areas.

2. Alternative 2, No Action Alternative.

a. Impacts: Those direct and indirect impacts are described in the Soils section of the University of Montana's environmental assessment, page 253, would apply here.

3. Alternative 3, Primary Use alternative.

a. Direct Impacts: No immediate change.

b. Indirect Impacts: In commercial forest areas where prolonged and heavy grazing occurred, soil compaction would be alleviated and soil stabilization would occur. Soil density would decrease and porosity would increase, thus reducing surface run off and erosion. Gaseous interchange and nutrient availability would improve.

d. Wildlife

1. Alternative 1, the Proposed Alternative.

a. Impacts: In commercial forest areas where livestock have been excluded the direct and indirect impacts as described below, under alternative 3, would apply.

2. Alternative 2, No Action Alternative.

a. Impacts: Those direct and indirect impacts as described in the University of Montana's environmental assessment, under this section, would apply here.

3. Alternative 3, Primary use alternative.

a. Direct Impacts: No immediate short-term affect to wildlife.

b. Indirect Impacts: In the commercial forest competition between livestock and wildlife for forage would be eliminated. Wildlife habitats would improve through areas of increased forage production and protective cover.

e. Fisheries

1. Alternative 1, the Proposed Alternative.

a. Direct Impacts: Break down of stream banks, hoofing action and soil compaction by livestock will increase sediment load and turbidity in streams. It is assumed, within the Flathead Indian Reservation, that sediment production from rangeland is second only to croplands in total sediment production. Such factors directly affect water quality and indirectly affect fisheries. Livestock will also introduce fecal coliform into the water, but in most instances levels are below those standards for non-point pollution in recreational areas.

In addition livestock grazing will reduce cover along stream banks, thus reducing shade and raising water temperatures. Certain fish species are intolerant to temperatures over 70°F.

b. Indirect Impacts: As described in the Forest Management Plan, the establishment of Limited Management zones within streamside areas will maintain the integrity of stream ecosystems. As streamside management guidelines are developed they would include appropriate livestock use restrictions. Such restrictions would ultimately minimize conflicts and degradation of water resources and improve fishery habitats in commercial forest zones.

2. Alternative 2, No Action Alternative

a. Impacts: Those direct and indirect impacts as described on page 256 and above under Alternative 1, would for the most part, apply here. As needed, streamside protection would be afforded to sensitive stream ecosystems.

3. Alternative 3, Primary Use Alternatives.

a. Direct Impacts: No immediate short-term impacts to fisheries would occur.

b. Indirect Impacts: Subsequent rehabilitation and stabilization of stream ecosystems in commercial forest areas, would minimize conflicts with other water uses and improve water quality and fishery habitats.

f. Wilderness

1. Alternative 2, No Action Alternative.

a. Direct Impacts: Presently, there is a "Wildlife Use" designation for tribal range units associated with tribal wilderness and other sensitive areas. This designation places limitations on the intensity and duration of stocking levels, primarily for the enhancement of wildlife, recreational and aesthetic values. It is doubtful, with the sensitive control of livestock numbers, that severe problems will occur in wilderness areas from livestock grazing.

b. Indirect Impacts: None are anticipated.

2. Alternative 3, Primary Use Alternative.

a. Impacts: Presently, Tribally designated wildernesses are without commercial forest classification. Impacts, as contained under alternative 3 above, would apply.

g. Recreation

1. Alternative 2, No Action Alternative

a. Impacts: Those direct and indirect impacts as described in the University of Montana's environmental assessment would apply here.

2. Alternative 3, Primary Use Alternative.

a. Direct Impacts: Livestock grazing would be eliminated in areas of recreational use which are located in Commercial forest lands.

b. Indirect Impacts: Areas, in commercial forest where livestock have been a nusance to recreationalist, would become esthetically more attractive to recreational use.

h. Archaeology/Cultural Heritage

1. Alternative 2 & 3, The No action and Primary Use Alternatives.

a. Direct Impacts: None are anticipated.

b. Indirect Impacts: None are anticipated.

i. Human and Community Developments

1. Alternative 2, No Action Alternative.

a. Direct Impacts: None are anticipated.

b. Indirect Impacts: To some extent those indirect impacts as described in the University of Montana's environmental assessment would apply here.

2. Alternative 3, Primary Use Alternative.

a. Direct Impacts: Alternative 3, if implemented would severely impact Indian livestock operations within the Flathead Indian Reservation. This is assumed because over 90% of all Tribal range units which are located in commercial forested areas are permitted to Indian Stockmen. Approximately 225,000 acres of range lands which are associated with commercial forest would be eliminated from grazing, leaving 95,000 acres of grasslands and noncommercial forest open to range management considerations.

From this 95,000 acres, an additional 65,000 acres of noncommercial forest, grasslands and forest parks may also be idled due to fencing infeasability, resulting in an incapability to isolate these areas from commercial forest areas and including them into manageable range units. The remaining 20,000 acres, of 320,000 acres presently in range unit status would not be affected by this alternative.

b. Indirect Impacts: Subsequent reductions of livestock numbers would cause livestock operators to seek alternative pastures which are insufficiently available and because of their competitive nature, difficult to obtain. Because most livestock operators cannot sustain their livestock operations on their home base alone, they would be forced to seek alternative income or relocate their operations off the reservation. No economic analysis, showing actual losses to livestock operations, has been conducted, but presumably, losses incurred would be in the million dollar range. Conversely, the Tribes would lose approximately fifty thousand dollars in grazing revenues.

j. Threatened and Endangered Species

1. Alternative 2, No Action Alternative.

a. Impacts: Those direct and indirect impacts as described in the University of Montana's environmental assessment, page 259, would also apply here.

2. Alternative 3, Primary Use Alternative.

a. Direct Impacts: None are anticipated.

b. Indirect Impacts: There would be a benefit to certain threatened and endangered species through habitat improvement.